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Aquilegia

The Cultivated and Wild Columbines

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1. Crimson Star, a popular garden columbine, see page 134. Unless otherwise indicated in individual cases, the illustrations in this paper are magnified as follows: habit x ½, separate sepal and petal x ½, follicles x 1, staminodium, in this figure, at lower right, x 2½.

Gift
L. H. Bailey
4-2-46

ARTICLE 1.
AQUILEGIA
THE CULTIVATED AND WILD COLUMBINES.

"Long-spurred columbines" is a phrase familiar to every gardener and describes plants of loveliness and charm. But as I have observed the various columbines in the preparation of this paper, I have again been impressed by the beauty and variety offered by other species than those with long spurs. The gardener who confines his attention to the one group misses many others suited to various purposes and with desirable colors and forms and foliage not occurring in those with long spurs. In fact, there are few groups of plants richer in the variety of their offering.

Nor are columbines difficult to maintain in the average garden. Many of the species and garden strains have a remarkable tolerance, doing equally well in New York state and southern California. Others do not accommodate themselves to so wide a variety of conditions. In a hot dry climate they do best in partial shade, in a cooler region they are more tolerant of sun. In the North they should have some winter protection, such as dry leaves. Seed sown in early spring, in coldframes or open air, may bloom the first season, but are not apt to do so. However, midsummer sowing, which should be in shaded cool soil, gives flowers the next summer. In some species, such as *A. cærulea* and *A. glandulosa*, the plants are likely to live for only two or three years and must be continuously renewed, while others are longer-lived. Professor Edgar Anderson writes me, for example, that in his experience *A. chrysantha* is very long-lived. Duffy (Amer. Home iii, 456, 502, 504, 1930) says the ordinary life of a cultivated Aquilegia is three to four years, but believes it can be prolonged by prevention of seed production, hence by removal of flowers after blooming. For best development of columbines a light sandy soil is preferable, but some will succeed in a fairly heavy ground.

Judging from experience at the Bailey Hortorium it is difficult to obtain absolutely pure seed for many of the species because of their tendency to hybridize. Plants used for producing seed should, therefore, be grown at some distance from others. A certain amount of propagation from desirable individuals can be accomplished by division of the roots, but relatively few plants can be obtained in this manner.

Columbines have been long in cultivation, those first grown naturally being European species, such as *A. vulgaris* and *A. alpina*, the long-spurred

types not being known until their discovery in the western United States well along in the last century. According to Boothman (Gard. Chron. ser. 3, xcv, 12, 1934) the first mention of the columbines "appears to be that by Theophrastus in the Eighth Book of Plants (371–287 BC) in which they were called Diosanthus. In the first century they were classed with the Isopyrums by Dioscorides; and, after many vicissitudes, the name Aquilegia became permanent. In 1597 Gerard, in his Herbal, mentioned seven kinds which were mostly colour and multipetalous forms of *A. vulgaris*." In 1824 DeCandolle (Prodr. i, 50–51) recognized thirteen species; by 1878 Baker (Gard. Chron. ser. 2, x, 19, 76, 111, 203) included twenty-seven in his synopsis. Since then the number of botanical species known has steadily increased and many new horticultural forms have been and even now are constantly being produced. A number of more recent treatments of the genus has appeared. One by P. Brühl (Journ. Asiatic Soc. Bengal, lxi, pt. 2, 270–324, 1893) has been almost entirely overlooked; it is not complete but is of some use, particularly for Asiatic species. Another by Rapaics (Bot. Közlem., Budapest, viii, 117–136, 1909) is quite impossible to use and puts together under a given species quite distinct entities, such as *truncata* as a form under *A. canadensis* and *longissima* as a form under *A. cærulea*. Altogether Rapaics recognized only twenty-five species and keyed only those from Europe. By far the best of the more recent papers is that on North American species by E. B. Payson (Contr. U. S. Nat. Herb. xx, 133–157, 1918). The synopsis by Boothman mentioned in the first part of this paragraph is the most comprehensive treatment thus far, but it has no keys and only very brief and informal descriptions. There has been no key to the species of Aquilegia for the genus as a whole.

Genetics of Aquilegia

Sufficient information has been obtained from experimental studies on inheritance in Aquilegia to throw light not only on behavior of certain characters and expectancy in hybrids, but also on species concepts. It would seem worth while, then, to summarize briefly what is available in this general field. It has long been known that the various species of columbine can readily be crossed (Berkeley, in Journ. Roy. Hort. Soc. v, 167, 1850). Anderson and Schafer (Ann. Bot. xlv, 639–646, 1931) point out that crosses of utterly unrelated species can be obtained and are at least partially fertile. The prevailing chromosome number in the genus seems to be $2n=14$, with occasional strains reported (in *A. chrysantha* and *A. vulgaris*) with $2n=16$. The chromosomes are small and with no gross differences so that the genus is poor for cytological study. Gregory (Trans. Amer. Phil. Soc. n.s. xxxi, 457–458, pl. 3, 1941) in a large paper on phylogeny and cytology in Ranunculaceæ lists the chromosome numbers for

about sixteen species of Aquilegia as 14 and for one (*A. hirsutissima* Timb.) as 28. He says "this genus is one of the most remarkable groups among the angiosperms for its interfertility. Polyploidy is exceptionally rare and the diploid interspecific hybrids show very little sterility. This fact becomes even more remarkable when it is noted that the high interfertility is just as common between species on opposite sides of the earth as between geographically related species." On the basis of the small chromosomes and the general cytology, he would place Aquilegia (with Isopyrum and Anemonella) near to Thalictrum and rather far from Actæa and Helleborus, near which genera it is placed in the Engler system. Anderson in 1931 (Amer. Nat. lxv, 144–148) had called attention to the fact that widely different species of Aquilegia readily cross and have only slight physiological barriers to such process. Since the genus possesses little or no asexual reproduction, sterile hybrids are unimportant. As there is virtually no polyploidy, true-breeding hybrids cannot be produced and only relatively homozygous hybrid segregates will perpetuate their kind. This means much selection and rogueing to get desirable garden hybrids to come true. It means also that in nature species of Aquilegia are likely to exist only where there is some degree of isolation, geographical, altitudinal, or what not. Where there is overlapping of range, intergradation will be expected. Yet, evidence for the ability of a species to maintain itself was obtained by an interesting study by Anderson and Schafer (Amer. Nat. lxvii, 190–192, 1933) on "Vicinism in *A. vulgaris*" made in a garden where the following species grew in successive rows in the order indicated: *A. vulgaris*, *A. vulgaris*, *A. vulgaris*, *A. Skinneri*, *A. pyrenaica*, *A. pyrenaica*, and *A. cærulea*. All the seed was harvested from a plant of *A. vulgaris*, recessive for two Mendelian factors, to test intra-specific and inter-specific out-crossing. This plant was adjacent to plants of *A. vulgaris* carrying the dominant factors and to *A. Skinneri*, with which artificial pollination proved it to be fertile. Tests made of the progeny showed that out-crossing within the species produced some 16 percent of the offspring, but that effective out-crossing with *A. Skinneri* or with any of the other species nearby had not occurred.

The tetraploid mentioned in an earlier paragraph is not the only one reported. What Gregory's material of *A. hirsutissima* was I do not know, but most tetraploids observed have been produced experimentally, notably that by Skalinska (for example, Biblioth. Univ. Liberæ Poloniæ, ser. B, iv, 1–34, 1937, Amer. Nat. lxxi, 610–612, 1937, Biol. Abstr. xii, entry 9082, 1938) who found it incompatible with diploids and who proposed the name *A. Janczewskii* for it.

Another way of expressing the situation is that by Clausen, Keck and Hiesey (Carnegie Inst. Wash. Publ. dlxiv, 77–79, 1945): "The genus

Aquilegia is exceptional in combining extreme morphological and ecological variability with a high degree of crossability. In other words, differentiation in this genus has proceeded a great distance morphologically and ecologically without developing distinct cenospecies, and the barriers that separate the units are more strongly geographic than cytogenetic. The genus encircles the northern hemisphere and has developed distinguishable forms that inhabit climates ranging from warm-temperate to arctic-alpine. During this dispersion and differentiation the genus failed to develop internal barriers to interbreeding, and all the wild forms remained on the diploid level with 7 pairs of chromosomes."

Further on they state, "These results lead to the conclusion that Aquilegia is one huge cenospecies composed of only a few ecospecies. Probably most of the recognized 'species' are merely morphologically distinguishable ecotypes or subspecies. This evolutionary status is of much interest, because it possibly represents a youthful stage experienced by many other, now mature genera, before they developed strong barriers to interbreeding, with polyploidy following."

A somewhat different interpretation as to species limits is expressed by Epling (Science, cii, 675, 1945) when he points out that although fertile hybrids between two species may be produced in the garden, there may be at play in nature barriers other than fertility. The experimental results obtained by Anderson and Schafer in their work cited above on "Vicinism in *A. vulgaris*" seem to support this point of view.

Anderson and Schafer pointed out another fact, a most remarkable situation, which explains why the various garden hybrids are so difficult or even quite impossible to place as to origin. The crosses made between various species (for example, these three: *A. chrysantha* x *A. vulgaris*, *A. ecalcarata* x a form of *A. vulgaris*, and *A. ecalcarata* x *A. chrysantha*) resembled each other very much and approached *A. vulgaris*, even when that species was not a parent. When we remember that we are here dealing with parents without spurs, with medium hooked spurs and with long straight spurs, and differing as widely in other characters, we would not expect similar hybrids from the different crosses. The investigators point out that medium long spurs are dominant over very long and very short, and that wide laminæ are dominant over long laminæ. Thus the hybrids seem to revert toward primitive conditions. Anderson writes me that they also found (but did not publish) that the desert yellows, such as *A. chrysantha*, carry many dominant factors for suppressing bright color. The pale shades of the cultivated long spurs probably come from this.

Some progress has been made in the more exact analysis of gene loci, one of the more recent papers being by Miss Schafer (Journ. Genetics, xli, 339–347, 1941) on *A. vulgaris*. She found that blue (B) is dominant over

pink (b), tallness (C) over compactness (c), blue (L) over lilac (l), whole color (A) over "white face" (a^w) over white (a). She found c-l-a linked in that order, with B/b assorting independently. Normally doubleness is independent, but sometimes linked. Using her terminology, BL = pale sky blue, Bl = lilac, bL and bl = pink, c = half as high as C, in c the flowers are subvertical, in C they are at first nodding. Thus we see how erect forms can appear in species ordinarily with nodding flowers. Letellier (Zeitschr. Indukt. Abstamm.-u. Vererb. lvii, 1–36, 1930) reported that doubleness is dependent on a single dominant, but two genes are indicated when the degree of doubleness is considered. Mutations of the various genes enumerated above would produce quite a number of different types of plants.

Concept of the genus Aquilegia

In this paper I am following the more traditional concept of the genus Aquilegia rather than that of Drummond and Hutchinson (Kew Bull. 1920, 145–169). These authors transferred spurless plants to Semiaquilegia, but have not been entirely followed by all later workers (Ulbrich, Notizbl. Bot. Gart. Berlin, x, 867, 1929 and Handel-Mazzetti, Act. Hort. Gotoburg. xiii, 44, 1939), at least for the more columbine-like species such as *A. ecalcarata* and *A. micrantha* var. *mancosana*. The situation is discussed in more detail under the individual species.

Taxonomic characters

Payson (Contr. U. S. Nat. Herb. xx, 133–137, 1918) has given so excellent an account of usable characters and morphology that the reader is referred to his paper. In general his ideas seem to be as valid now as when written, except that I would question his statement on page 136 that "the genus had its genesis in America." Asiatic species like *A. ecalcarata* and *A. nivalis* seem to me more primitive than any American ones. His phylogenetic point of view based on distribution and morphology seems on the whole quite sound so far as American species are concerned. He felt that medium height was more primitive than low scapose or tall much-branched stems; that the biternate leaf preceded simpler and more complex leaves; that nodding flowers came before erect ones; that blue color gave rise to white, these to yellow, then these to red. In general, alpine species and those of hotter more arid regions are advanced. There is evidence that the petals are akin to greatly modified stamens (Eames, in Amer. Journ. Bot. xviii, 147–188, 1931). From comparison with related genera one would expect that large laminæ and saccate spurs came before small laminæ and elongate spurs, although a secondary reduction of spur (*A. micrantha* var. *mancosana*) is possible. On the whole, the genus is one of great variability, with sun-forms and shade-forms, geographical and other variants, so that species do not stand out clearly in all cases.

Intrageneric divisions

Various attempts have been made to place the species of the genus in related groups or sections. Baker (Gard. Chron. ser. 2, x, 19 and 203, 1878) in his useful synopsis of the genus wrote "For horticultural purposes we may conveniently divide the Columbines into three groups, according to the size of the flower, which I call Micranthæ, or small-flowered Columbine; Mesanthæ, or middle-sized flowered species; and Macranthæ, the large-flowered kinds. Each of these three groups is represented both in the Old and New World." His Micranthæ had sepals 12–20 mm. long and included species like *A. Einseleana*, *A. thalictrifolia*, *A. lactiflora*, *A. pubiflora*, *A. brevistyla*, *A. viridiflora*, *A. canadensis*, *A. flavescens*. Mesanthæ had sepals about 2.5 cm. long and had *A. pyrenaica*, *A. Bertolonii*, *A. flabellata*, *A. brachyceras*, *A. vulgaris*, *A. sibirica*, *A. formosa*, *A. chrysantha*, etc. And Macranthæ, with sepals 3–4 cm. long, were *A. glandulosa*, *A. alpina*, *A. fragrans* and *A. cærulea*. From the botanical standpoint such a grouping is of course purely artificial and entirely unsatisfactory.

Borbás (Magyar Tudom. Akad. xii, no. 6, 1–19, 1882) attempted a more natural arrangement:

I. Subscaposæ (small glandular plants, with leaves mostly basal).
  1. Orthocentræ (spurs straight).
    a. Brachycentræ (spurs shorter than laminæ).—*A. Kitaibelii*, *A. Bauhinii*, *A. parviflora*.
    b. Mesocentræ (spur equalling or exceeding laminæ).
      aa. Micranthæ.—*A. aragonensis*, *A. thalictrifolia*, *A. discolor*.
      bb. Mesanthæ.—*A. nivalis*, *A. Einseleana*, *A. grata*, *A. pyrenaica*.
  2. Campylocentræ (spurs much curved).—*A. viscosa*, *A. Reuteri*, *A. subscaposa*, *A. Bertolonii*, *A. transsilvanica*.

II. Elatiores (larger, with leafy stems).
  A. Brevicornes (spurs shorter than laminæ).
    1. Micranthæ.—*A. davurica*, *A. brevistyla*, *A. pubiflora*.
    2. Mesanthæ et Macranthæ.—*A. Bernardii*, *A. jucunda*, *A. glauca*, *A. fragrans*, *A. aurea*.
  B. Vulgares (spurs not shorter than laminæ; flowers about as long as wide).
    1. Camylocentræ (spurs hooked).
      a. Micranthæ.—*A. dichroa*.
      b. Mesanthæ.—*A. sibirica*, *A. flabellata*, *A. Karelinii*, *A. atrata*, *A. vulgaris*.
      c. Macranthæ.—*A. oxysepala*, *A. caucasica*, *A. olympica*, *A. Haenkeana*.
    2. Ambiguæ (spurs straight or nearly so).
      a. Macranthæ.—*A. alpina*.
      b. Mesanthæ.—*A. flavescens*, *A. Moorcroftiana*, *A. hispanica*, *A. Amaliæ*, *A. Ottonis*, *A. nevadensis*.
  C. Longicornes (flowers, including spurs, about twice as long as wide).
    1. Spurs hooked.—*A. campylocentra*.
    2. Spurs straight.

a. Lamina none or very short.—*A. eximia, A. truncata.*
b. Lamina longer: spur not twice longer than lamina.—*A. atropurpurea, A. viridiflora.*
c. Spur about twice the lamina.—*A. Buergeriana, A. nigricans, A. lactiflora.*
d. Spur about four times the lamina.—*A. canadensis, A. formosa, A. Skinneri, A. chrysantha, A. cærulea.*

Here again the presentation seems to me quite artificial. Use of flower size, relative length of spur and lamina, whether spur is hooked or not, are repeated too many times. Inclusion of *A. canadensis* and *A. cærulea* in the same small group; separation of *A. jucunda* from *A. glandulosa*, of *A. davurica* from *A. viridiflora*, of *A. Bauhinii* from *A. Einseleana*, of *A. flavescens* from *A. formosa*, of *A. nigricans* from *A. subscaposa*—such treatment is scarcely natural.

Payson (Contr. U. S. Nat. Herb. xx, 133–157, 1918) in his revision of the North American species set up three sections: (1) Cyrtoplectræ with biternate leaves, small blue or white nodding flowers, large dilated laminæ, short usually hooked spurs, mostly included stamens, short styles; largely Eurasian. (2) Rhodanthæ, with biternate or triternate leaves, larger yellow or red usually nodding flowers, mostly short laminæ, exserted stamens and long styles; American. (3) Macroplectræ, with biternate or triternate leaves, large erect blue, white or yellow flowers, large and dilated laminæ, long slender straight spurs, exserted stamens, medium-long styles; American.

For American species only, this grouping is fairly satisfactory, but to throw all the Eurasian plants into section 1 means making considerable change in its characterization as given by Payson, and the section becomes almost meaningless. Some Old World species have triternate leaves, many are large-flowered, not always blue or white and with spurs often straight. Yet to separate this section into natural groups is very difficult. The only feasible division I can see would be on the spurs, whether hooked or not, and in some species this is not at all clear, for example in *A. alpina* and in the Himalayan species.

Prantl (Engler and Prantl, Natürl. Pflanzenfam. III^2, 59, 1891) did not recognize sections in the genus. Boothman in his synopsis (Gard. Chron. ser. 3, xcv, 12, 1934) used a different approach, recognizing several groups, such as the Vulgaris group, the Alpine group, the Himalayan group, etc., each from a fairly definite geographical area, as well as with some botanical characters. But these latter break down and the groups again are not definite nor natural. I do not see much gain in an arrangement into sections or groups unless these key out satisfactorily and arrange themselves with some definiteness. In this paper I am not using any such subgeneric classification.

As to species arrangement, *A. ecalcarata* (Asia) with the most poorly

developed spurs certainly seems primitive. When it has spurs, they are merely saccate or straight, but not hooked. In fact, the general evolutionary trends in the genus seem to have been the straight-spurred line on the one hand and the hook-spurred on the other. Long spurs, erect flowers, reduced laminæ, exserted stamens, long styles, alternate leaves, are all signs of specialization. *A. nivalis* (Asia) and *A. parviflora* (Asia) seem close to *A. ecalcarata* in their short spurs, and since these are curved they may indicate a step toward the hooked spurs of the *vulgaris* group. In this group *A. saximontana* (America), *A. sibirica* (Asia) and *A. flabellata* (Asia) have glabrous follicles and short styles and seem related. *A. Jonesii* (America) is perhaps a specialized offshoot in this region, having glabrous follicles and short spurs, included stamens, but the spurs are not much curved, the flowers are erect, and staminodia are lacking. Most of the *vulgaris* group have pubescent follicles. In America are two short-styled species, with included stamens and short spurs, *A. brevistyla* and *A. laramiensis*. Other species of this group are Eurasian; they are many and do not exhibit very clearly defined subgroups. Such species as *A. Ullepitschii*, *A. Paui* and *A. Litardierei* seem primitive in having laminæ as long as sepals; *A. glandulosa*, *A. transsilvanica* and *A. pubiflora*, while with laminæ shorter than sepals, have them large and spurs short. Then as we proceed to relatively longer spurs, we have *A. vulgaris*, *A. olympica*, *A. Kareliniana*, *A. oxysepala*, etc., with stamens relatively short, and *A. Ottonis*, *A. atrata*, *A. nigricans*, etc., with them longer. *A. aurea* is set apart by color.

Proceeding to the straight-spurred series, we have three groups: (1) the *alpina-Buergeriana* complex, Eurasian, with flowers nodding, mostly blue or blue and white, and with spurs short. Here come *A. Einseleana*, *A. thalictrifolia*, *A. pyrenaica*, *A. Bertolonii*, *A. fragrans*, *A. viridiflora*, *A. lactiflora*, *A. Rockii*, etc. (2) The *formosa-canadensis* group, American, with flowers nodding, yellow, or red and yellow. Here come *A. flavescens*, *A. Shockleyi*, *A. eximia*, *A. triternata*, *A. Skinneri*, etc. (3) The *cæruleachrysantha* group, American, with flowers erect, blue and white to white, to yellow, and developing long spurs. Here are also *A. scopulorum*, *A. Hinckleyana*, *A. micrantha*, *A. pubescens*, *A. Chaplinei*, and *A. longissima*.

Preparation of this paper

In the herbarium a study was made of some 4000 specimens which were obtained from the following institutions: Gray Herbarium, New York Botanical Garden, Philadelphia Academy of Sciences, United States National Herbarium, Chicago Museum of Natural History, Botany Department of Cornell University, with smaller special loans from University of Wyoming, California Academy of Sciences, University of California, and Pomona College. To those who have so kindly made such material available I am

greatly indebted. A very considerable number of growing plants had also been assembled at Ithaca and these were of value; dried material of them and of earlier cultures is in the herbarium of the Bailey Hortorium.

Particular mention should be made of the kindness of Professor Edgar Anderson of Missouri Botanical Garden, whose interest in the genus Aquilegia goes back to some years of genetical and other studies. Not only did he send me his herbarium specimens of the plants used and produced in his crosses, but included notes and other data, and kindly offered to read this paper while in manuscript. I appreciate very much his help and judgment, but I of course assume all responsibility for my conclusions. I wish also to mention Miss Ruth Sanderson, librarian at Gray Herbarium, for her great help in bibliographical matters. Then to Miss Florence Mekeel, Hortorium artist, is due special acknowledgment for her usual beautiful and accurate delineation of species from specimens often only all too meager.

In this paper I am following the usual botanical format of a revision, namely with keys and descriptions. Then at the end of each species is a brief discussion of its horticultural aspects: use and history and nomenclature, so far as I can determine them. I am recognizing 67 species, not because I am confident that all such should be maintained, but because for some of those from abroad we lack in this country adequate material to judge their status. In such cases I have tried to follow the best judgment I could obtain from the writings of foreign botanists who have seen such material. Such a treatment brings before us a display of the various columbines, so that material can be identified and placed. It is presented with the hope that it may help in the experimental work necessary to establish the status of the various entities, whether ecospecies, subspecies, ecotypes, or what not, as well as in the more immediate problem of botanical and horticultural identification.

The Species and Varieties

AQUILEGIA Linn. Sp. Pl. 533 (1753). Columbines.

Perennial herbs usually with several erect stems from a thick caudex: basal leaves mostly tufted, ternately to triternately compound, with long petioles which are dilated at base; cauline leaves usually present and reduced in size and complexity upward, rarely lacking; leaflets cuneate, obovate or suborbicular, the two lateral ones usually 2-fid, the central one 3-fid, these divisions generally again divided into 3 or more lobes: stems with 1 to several ascending branches, these with leafy 1–3-parted bracts and terminal flowers which nod in bud, and nod or are erect in anthesis; sepals 5, regular, more or less spreading, petaloid, deciduous; petals 5, regular, alternate with sepals, each consisting of two parts, the upper expanded lamina and basal hollow extension or spur with nectary at its apex; laminæ from broadly obovate to quite lacking; spurs from elongate-tubular and straight, curved, or hooked, to almost lacking and saccate; stamens

many, the inner ones normally reduced to a sheath of flattened erect staminodia; carpels 5 or variable, with terminal styles: fruit a head of more or less erect follicles with prominent reticulate veining and short beak; seeds usually black, shining, numerous, narrow-obovoid. (Derivation of name variously given: *aquila*, eagle, the spurs suggesting the claws of the eagle, and *aquilegus*, water-drawer.)

Type species, *A. vulgaris* Linn. A genus of the northern hemisphere, mostly of the temperate zone, but extending into the boreal zone (altitudinally and latitudinally) and southward into the mountains of northern Mexico and northern Africa.

Since it is very difficult to bring into one key with clearly defined alternatives all the species of Aquilegia, this general key is followed by a separate one for North American species only, with the hope that it may prove useful to North American botanists.

*General key to species of Aquilegia**

A. Spurs lacking or saccate, then less than 3 mm. long.
  B. Sepals 30–40 mm. long; laminæ 20–25 mm. long.
    C. Flowers erect, blue.....61. *A. cærulea*
    CC. Flowers nodding, in many colors.....16. *A. vulgaris* (horticultural forms)
  BB. Sepals 10–25 mm. long; laminæ 5–15 mm. long.
    C. Laminæ yellow, 5 mm. long; sepals red, 15–25 mm. long. Northern California.....52. *A. formosa* f. *anomala*
    CC. Laminæ 10–15 mm. long; sepals 10–15 mm. long.
      D. Flowers generally erect; staminodia acutish.
        E. Leaves and plant viscid: flowers usually whitish. Colorado.....60. *A. micrantha* var. *mancosana*
        EE. Leaves and plant not viscid: flowers usually wine-colored to rich purple. Western China.....1. *A. ecalcarata*
      DD. Flowers pendent; staminodia blunt.....16. *A. vulgaris* var. *stellata*
AA. Spurs definitely present, more than saccate.
  B. The spurs strongly hooked at end.
    C. Flowers yellow, sometimes with reddish tinge.
      D. Sepals 10–15 mm. wide; laminæ 15–20 mm. long; stamens included. Balkans.....30. *A. aurea*
      DD. Sepals 5–8 mm. wide; laminæ 6–10 mm. long; stamens exserted. Western North America.....51. *A. flavescens*
    CC. Flowers not yellow.
      D. Carpels essentially glabrous over their general surface.
        E. Sepals 8–12 mm. long; laminæ 7–8 mm. long: follicles 10 mm. long. Colorado.....4. *A. saximontana*
        EE. Sepals 15–30 mm. long; laminæ 10–16 mm. long: follicles 15–30 mm. long.
          F. Stems nearly or quite leafless except for leafy bract or bracts near summit: pedicels glabrous. Siberia.....6. *A. sibirica*
          FF. Stems with some well developed leaves as well as upper bracts: pedicels glandular-pubescent. Japan.....5. *A. flabellata*

*Since measurements were made from pressed specimens, length of sepals as given in the keys and descriptions does not include the basal claw, and width of spurs is from the flattened spurs.

DD. Carpels definitely pubescent over their general surface.
EE. Spurs considerably shorter than the laminæ.
F. Length of sepals 18–45 mm.
G. Sepals 7–9 mm. wide; laminæ 10–15 mm. long: leaves pilose beneath. Himalayan region.....15. *A. pubiflora*
GG. Sepals 12–25 mm. wide.
H. Width of sepals 15–25 mm.; laminæ 15–25 mm. long.
I. Leaves pilose beneath: spurs strongly hooked. South-central Siberia.....13. *A. glandulosa*
II. Leaves slightly pubescent beneath: spurs curved, scarcely hooked. Hungary.....14. *A. transsilvanica*
HH. Width of sepals 12–15 mm.; laminæ 10–12 mm. long: leaves subglabrous. Himalayan Mountains....2. *A. nivalis*
FF. Length of sepals 10–16 mm.
G. Leaves ternate: sepals and petals subequal.
H. Flowers violet-blue; sepals elliptic-ovate, 14 mm. long. Corsica.....10. *A. Litardierei*
HH. Flowers pale blue to white; sepals elliptic-lanceolate, 10 mm. long. Spain.....11. *A. Paui*
GG. Leaves biternate: sepals often longer than laminæ.
H. Stems 5–25 cm. high: flowers equalled or exceeded by leaves.
I. Sepals and laminæ whitish; laminæ 10–12 mm. long. Wyoming.....8. *A. laramiensis*
II. Sepals blue; laminæ yellowish, 7–8 mm. long. Colorado.....4. *A. saximontana*
HH. Stems 30–80 cm. high: flowers well above the leaves.
I. Sepals blue; laminæ whitish, 8–10 mm. long. Alaska to South Dakota.....9. *A. brevistyla*
II. Sepals yellowish to blue or purple; laminæ of same color as sepals, 11–12 mm. long. Himalayan Mountains.....15. *A. pubiflora* var. *mussooriensis*
EE. Spurs equal to or exceeding laminæ.
F. Flowers bicolored, the sepals blue to purple, the laminæ whitish at least at tips.
G. Leaves mostly once-ternate, then deeply cut; cauline leaves lacking: sepals blue-violet, 15–25 mm. long; laminæ 7–12 mm. long, whitish. Eastern Siberia and Korea.....27. *A. amurensis*
GG. Leaves biternate to triternate; cauline leaves present.
H. Laminæ 6–8 mm. long.
I. Leaves biternate, pubescent beneath only: staminodia obtusish. Portugal.....25. *A. dichroa*
II. Leaves triternate, pilose on both surfaces: staminodia acute. Serbia.....26. *A. Pancicii*
HH. Laminæ 10–20 mm. long.
I. Sepals claret-red to purplish-violet, 16–30 mm. long; laminæ yellow-white: leaves glabrous to puberulent, sometimes pilose.
J. The sepals 8–12 mm. wide; laminæ 10–13 mm. long. Eastern Asia.....19. *A. oxysepala*
JJ. The sepals 13–22 mm. wide; laminæ 14–20 mm. long. Caucasus.....17. *A. olympica*

II. Sepals blue to pale violet; laminæ white: leaves soft-pubescent to pilose beneath.

J. Plant glandular-viscid: sepals dark blue. Caucasus.....24. *A. colchica*

JJ. Plant usually not glandular-viscid: sepals lighter. Greece and Italy.

K. Laminæ rounded, 13–14 mm. long; spurs 13–14 mm. long; stamens not exserted...22. *A. Amaliæ*

KK. Laminæ truncate, 16–20 mm. long; spurs 18–20 mm. long; stamens exserted.....23. *A. Ottonis*

FF. Flowers concolored, the sepals and petals of same color.

G. Leaves mostly ternate.

H. Color of flowers pale blue to white.

I. Leaves glandular-pilose on both surfaces: stamens equalling laminæ; styles about 8 mm. long. Spain.....21. *A. montisicciana*

II. Leaves glabrous above, soft-pubescent beneath: stamens well exserted; styles about 5 mm. long. Eastern Siberia to Korea.....27. *A. amurensis*

HH. Color of flowers deep blue to purplish.

I. Stems 1–2 dm. high: leaflets 1–1.5 cm. long. Carpathian Mountains.....12. *A. Ullepitschii*

II. Stems taller: leaflets mostly larger.

J. Stamens scarcely exserted; sepals violet, 18–25 mm. long. Lower Austria and Bosnia.....16. *A. vulgaris* var. *notabilis*

JJ. Stamens exserted 3–5 mm.; sepals dark blue-violet, 25–35 mm. long. Tyrol to Bulgaria and Montenegro.....29. *A. nigricans*

GG. Leaves mostly biternate.

H. Stamens exserted beyond laminæ 3–8 mm.; flowers dark.

I. Sepals dark purple-violet, mostly 15–24 mm. long; spurs 10–15 mm. long. Bavaria to France, Italy, Austria.....28. *A. atrata*

II. Sepals blue-violet, 25–35 mm. long; spurs 13–15 mm. long. Tyrol to Bulgaria and Montenegro. .....29. *A. nigricans*

HH. Stamens not or scarcely exserted.

I. Sepals 14–22 mm. wide, mostly 25–45 mm. long; laminæ 14–20 mm. long.

J. Color of sepals claret to purplish: leaves pilose beneath, the ultimate lobes 3–6 mm. wide. Caucasus.....17. *A. olympica*

JJ. Color of sepals blue: leaves subglabrous, the ultimate lobes 1.5–2.5 mm. wide. Alps.....41. *A. alpina*

II. Sepals mostly 6–14 mm. wide, mostly 15–30 mm. long; laminæ 9–14 mm. long.

J. Spurs 10–14 mm. long.

K. Leaves slightly puberulent beneath: sepals 6–10 mm. wide. Western Siberia..18. *A. Karelíniana*

KK. Leaves somewhat pilose beneath: sepals 9–18 mm. wide. Italy.....34. *A. Bertolonii*

JJ. Spurs usually 15–22 mm. long.

K. Sepals divergent, acuminate, purplish, 16–26 mm. long; staminodia acute, 5–6 mm. long: follicles 12–17 mm. long: leaves glabrous to pubescent beneath. Eastern Asia. . . . . 19. *A. oxysepala* var. *Yabeana*

KK. Sepals spreading or divergent, violet or blue to rose or white; staminodia 7–8 mm. long: leaves usually more pubescent beneath.

L. The sepals subacuminate, lilac-blue, 22–27 mm. long; staminodia acute: follicles about 12 mm. long. Southern France. . . . . 20. *A. viscosa*

LL. The sepals usually abruptly acute to obtuse, violet to white, 15–40 mm. long; staminodia rather blunt at apex: follicles 15–25 mm. long. Widespread in Europe; naturalized eastern North America. . . . . 16. *A. vulgaris*

BB. The spurs straight to curved but not really hooked.

C. Flowers both red or yellow or red and yellow and nodding (not simply yellowish-white, nor yellow and erect).

D. Stamens shorter than laminæ; flowers yellow: leaves subglabrous. Japan. . . . . 47. *A. Buergeriana*

DD. Stamens exceeding laminæ. America.

E. Sepals horizontally spreading or reflexed, usually longer than spurs (not longer in *A. eximia* nor *A. micrantha*).

F. Laminæ 7–10 mm. long; flowers mostly yellowish.

G. Leaves viscid beneath: spurs straight or curved outward, very slender. Southeastern Utah and southwestern Colorado. . . . . 60. *A. micrantha*

GG. Leaves not viscid beneath: spurs incurved, coarser. Range, British Columbia to Alberta, Colorado, Utah. . 51. *A. flavescens*

FF. Laminæ 0–6 mm. long; flowers mostly red and yellow.

G. Basal leaves biternate; leaflets 2–5 cm. long: laminæ 1–6 mm. long. Alaska to Montana, Utah, Lower California. . . . . 52. *A. formosa*

GG. Basal leaves mostly triternate.

H. Leaflets grayish, 0.5–3 cm. long, with rounded lobes: laminæ 3–5 mm. long: plants not markedly viscid. Nevada and eastern California. . . . . 53. *A. Shockleyi*

HH. Leaflets green, 1–4 cm. long, with pointed tips to the lobes: laminæ lacking: plants viscid. Coastal California. . . . . 54. *A. eximia*

EE. Sepals erect to somewhat divergent, not horizontally spreading, shorter than spurs.

F. The sepals not much longer than laminæ, with greenish tinge: leaflets 1–2.5 cm. long. Southeastern Utah to Colorado, New Mexico. . . . . 56. *A. elegantula*

FF. The sepals almost to quite twice the laminæ.

G. Leaves biternate.

H. Sepals about half as long as spurs: stems mostly 1.5–4 dm. high.

I. Leaflets quite glaucous on both surfaces, 10–15 mm. long: laminæ 4–5 mm. long. Northern Arizona. . . . . 55. *A. desertorum*

II. Leaflets green above, 10–40 mm. long: laminæ 6–8 mm. long. Eastern United States.....58. *A. canadensis*

HH. Sepals about three-fourths as long as spurs: stems mostly 4–8 dm. high.....58. *A. canadensis*

GG. Leaves largely triternate.

H. Spurs 18–25 mm. long; laminæ 5–8 mm. long; sepals red.

I. Sepals 10–14 mm. long; laminæ 5–6 mm. long. East of Rocky Mountains.....58. *A. canadensis*

II. Sepals 12–20 mm. long; laminæ 7–8 mm. long. Arizona and New Mexico.....57. *A. triternata*

HH. Spurs 35–50 mm. long; laminæ 12–20 mm. long; sepals greenish. Mexico.....59. *A. Skinneri*

CC. Flowers not both red or yellow and nodding (if so colored, erect).

D. Spurs less than 2.5 cm. long.

E. The flowers distinctly bicolored, the laminæ much lighter in color than the sepals.

F. Spurs and laminæ subequal.

G. Length of laminæ 6–8 mm.; sepals 10–17 mm. long: leaves glabrous beneath. Spain.....37. *A. discolor*

GG. Length of laminæ 13–20 mm.; sepals 18–30 mm. long: leaves pubescent. Greece and Italy.

H. Laminæ rounded, 13–14 mm. long; spurs 13–14 mm. long; stamens not exserted.....22. *A. Amaliæ*

HH. Laminæ truncate, 16–20 mm. long; spurs 18–20 mm. long; stamens exserted.....23. *A. Ottonis*

FF. Spurs distinctly longer than laminæ.

G. Stamens shorter than laminæ.

H. Sepals purple, divergent; laminæ yellow, 10–15 mm. long: leaflets 10–50 mm. long. Japan...47. *A. Buergeriana*

HH. Sepals blue, horizontally spreading; laminæ white, 8–10 mm. long: leaflets 15 mm. long. Siberia.46. *A. Borodinii*

GG. Stamens exceeding laminæ.

H. Sepals 18–22 mm. long, 9–10 mm. wide, purplish: leaves glabrous beneath. Eastern Siberia....49. *A. brachyceras*

HH. Sepals 15–18 mm. long, 6–8 mm. wide: leaves pubescent beneath. Northwestern India.

I. Plants 1–2 dm. high, densely pilose: petioles 3–7 cm. long; ultimate lobes of leaflets mostly 1–2 mm. wide. Afghanistan.....44. *A. afghanica*

II. Plants 2–4 dm. high, sparsely pubescent: petioles 5–15 cm. long; ultimate lobes of leaflets mostly 2–3 mm. wide. India.....43. *A. Moorcroftiana*

EE. The flowers concolored, sepals and laminæ of essentially same color.

F. Spurs distinctly shorter than laminæ.

G. Sepals 22–40 mm. long.

H. Laminæ 10–12 mm. long; sepals 12–15 mm. wide, 22–30 mm. long. Himalayan Mountains.....2. *A. nivalis*

HH. Laminæ 20–24 mm. long; sepals 16–22 mm. wide, 30–40 mm. long. Transylvanian Alps.....14. *A. transsilvanica*

GG. Sepals 12–20 mm. long.

H. Flowers wine-color to purplish; sepals 12–15 mm. long, 5–6 mm. wide. China.....1. *A. ecalcarata*

HH. Flowers violet; sepals 16–20 mm. long, 8–11 mm. wide. Balkans.....31. *A. Kitaibelii*

FF. Spurs almost equal to or longer than laminæ.

G. The spurs about as long as laminæ.

H. Laminæ 3–6 mm. long; spurs 3–7 mm. long; stamens exserted.

I. Sepals 15–20 mm. long: leaves biternate, pubescent beneath. Eastern Siberia.....3. *A. parviflora*

II. Sepals 10 mm. long: leaves ternate, puberulent. Eastern Pyrenees.....36. *A. aragonensis*

HH. Laminæ 8–20 mm. long; spurs 8–17 mm. long.

I. Follicles glabrous: staminodia lacking: leaflets crowded, 5–10 mm. wide, pubescent. Montana to Wyoming.....7. *A. Jonesii*

II. Follicles pubescent: staminodia present: leaflets expanded in normal fashion.

J. Sepals 10–14 mm. long, green to brown to purple; laminæ 10–14 mm. long; stamens somewhat exserted: follicles 10–15 mm. long. Eastern Asia.....45. *A. viridiflora*

JJ. Sepals 15–35 mm. long, violet to blue to white.

K. The sepals 7–8 mm. wide, 15–20 mm. long, blue-violet; spurs 7–11 mm. long. Tyrol and northern Italy.

L. Leaves glabrous beneath: stamens shorter than laminæ; laminæ 8–10 mm. long. .....32. *A. Einseleana*

LL. Leaves glandular-pubescent beneath: stamens slightly exceeding laminæ; laminæ 11–13 mm. long.....33. *A. thalictrifolia*

KK. The sepals 10–18 mm. wide, 18–35 mm. long; spurs 10–18 mm. long.

L. Laminæ 10–15 mm. long, blue; sepals blue to blue-violet; mature styles 8 mm. long.

M. Leaflets glabrous beneath: follicles 17 mm. long. Pyrenees.....35. *A. pyrenaica*

MM. Leaflets pilose beneath: follicles 12 mm. long. Southern Alps, etc...34. *A. Bertolonii*

LL. Laminæ 15–20 mm. long, pale; sepals pale blue, white to purplish.

M. Leaflets glabrous beneath: stamens shorter than laminæ; styles of mature fruits 10–15 mm. long. Corsica. .....38. *A. Bernardii*

MM. Leaflets usually pubescent beneath; stamens equalling laminæ; mature styles 8 mm. long. Northern India. .....42. *A. fragrans*

GG. The spurs longer than laminæ.

H. Leaflets glandular-pubescent or -pilose: stamens well exserted.

I. Flowers pale blue; sepals greenish at apex, long-attenuate. Spain.....39. *A. nevadensis*

II. Flowers whitish or mauve-violet; sepals not greenish at tips.

J. Sepals about 29 mm. long, 9–11 mm. wide, mauve-violet. Balkans.....40. *A. grata*

JJ. Sepals 8–20 mm. long, 3–6 mm. wide, whitish or very pale. Southeastern Utah, etc...60. *A. micrantha*

HH. Leaflets not glandular.

I. Flowers yellow; stamens included. Japan.....
.....47. *A. Buergeriana*

II. Flowers not yellow.

J. Sepals 22–45 mm. long; stamens shorter than laminæ.

K. Width of sepals 10–22 mm.: leaflets subglabrous beneath.

L. The sepals 20–35 mm. long, 10–16 mm. wide; laminæ 12–15 mm. long: follicles 13–17 mm. long. Spain.....35. *A. pyrenaica*

LL. The sepals 30–45 mm. long, 14–22 mm. wide; laminæ 14–17 mm. long: follicles 20–28 mm. long. Alps.....41. *A. alpina*

KK. Width of sepals 7–9 mm., length 22–32 mm.: leaflets pubescent beneath. Western China.
.....48. *A. Rockii*

JJ. Sepals 13–20 mm. long; stamens not shorter than laminæ.

K. Carpels glabrous, 14–22 mm. long; styles 12 mm. long; spurs 8–15 mm. long; sterile staminodia lacking. Montana-Wyoming.
.....7. *A. Jonesii*

KK. Carpels pubescent; spurs 12–20 mm. long; staminodia present.

L. Flowers whitish; laminæ 7–10 mm. long; staminodia 7–8 mm. long, blunt. Southwestern Siberia.....50. *A. lactiflora*

LL. Flowers blue to green or purplish; laminæ 10–13 mm. long; staminodia 6–8 mm. long, acute.

M. Sepals definitely longer than laminæ (if not, bluish), spreading, 13–18 mm. long.

N. Stems mostly 8–20 cm. high: basal petioles 3–7 cm. long: sepals bluish, pubescent: leaflets apparently green on both surfaces. Afghanistan.....44. *A. afghanica*

NN. Stems 20–40 cm. high: basal petioles 5–15 cm. long: sepals purplish, slightly puberulent: leaflets glaucous. Northern India.....
.....43. *A. Moorcroftiana*

MM. Sepals scarcely longer than laminæ, divergent, 11–14 mm. long, green to brown or purple. Eastern Siberia to China.....45. *A. viridiflora*

DD. Spurs 2.5–15 cm. long; flowers erect.

E. Leaflets thick, closely clustered, 5–15 mm. wide: flowers white to bluish or reddish. Wyoming to Utah and Nevada..62. *A. scopulorum*

EE. Leaflets normal, not crowded, mostly larger.

F. Stamens not or scarcely exserted; sepals tending to be blunt; flowers blue to white or ochroleucous. Montana and Idaho to Grand Canyon, Arizona and northern New Mexico.....
.....61. *A. cærulea*

FF. Stamens plainly exserted; sepals tending to be sharp-pointed (except *A. Hinckleyana*).

G. Sepals 17 mm. wide: leaves biternate: laminæ 2 cm. long, 1.6 cm. wide. Western Texas.....66. *A. Hinckleyana*

GG. Sepals 5–10 mm. wide.

H. Spurs 25–40 mm. long; sepals 8–20 mm. long.

I. Stamens exserted 3–6 mm.; styles on mature fruits 8–12 mm. long.

J. Leaves viscid, biternate to triternate: sepals mostly white to pale blue or pinkish, 3–6 mm. wide. Southeastern Utah to adjacent Colorado and northwestern Arizona .....60. *A. micrantha*

JJ. Leaves glabrous to pubescent, but not viscid: sepals 5–9 mm. wide.

K. The leaves ternate to biternate: sepals cream to yellowish or pink. Sierra Nevada of California.....63. *A. pubescens*

KK. The leaves mostly triternate: sepals yellow. Colorado.....64. *A. chrysantha* var. *Rydbergii*

II. Stamens exserted 8–10 mm.; styles 15 mm. long; flowers yellow: leaves often triternate. Guadalupe Mountains of New Mexico and Texas..65. *A. Chaplinei*

HH. Spurs 40–150 mm. long; sepals 20–40 mm. long, yellow: leaves triternate.

I. Laminæ 10–16 mm. long; spurs 4–7 cm. long. Arizona and Colorado to Sonora and Chihuahua.....64. *A. chrysantha*

II. Laminæ 15–25 mm. long; spurs 9–15 cm. long. Western Texas to Coahuila and Nuevo Leon.....67. *A. longissima*

Key to North American species of Aquilegia

A. Spurs nearly or quite lacking.

B. Flowers red.....52. *A. formosa* f. *anomala*

BB. Flowers white to blue.

C. Sepals 10–15 mm. long, pale.....60. *A. micrantha* var. *mancosana*

CC. Sepals 30–40 mm. long, blue.....61. *A. cærulea* var. *Daileyæ*

AA. Spurs present.

B. The spurs hooked; laminæ longer than spurs.

C. Flowers white or blue and white.

D. Stems 0.5–2.5 dm. high: flowers equalled or exceeded by leaves.

E. Sepals and laminæ whitish; laminæ 10–12 mm. long: follicles pilose. Wyoming.....8. *A. laramiensis*

EE. Sepals blue; laminæ yellowish, 7–8 mm. long: follicles usually glabrous. Colorado.....4. *A. saximontana*

DD. Stems 3–8 dm. high: flowers above the leaves; sepals blue; laminæ whitish. Alaska to South Dakota.....9. *A. brevistyla*

CC. Flowers yellow or tinged with red. British Columbia to Alberta, Oregon, Colorado.....51. *A. flavescens*

BB. The spurs not hooked; laminæ not longer than spurs.

C. Flowers nodding, red or yellow, or both.

D. Sepals horizontally spreading or reflexed, usually longer than spurs (not longer in *A. eximia* or *A. micrantha*).

EE. Laminæ 7–10 mm. long; flowers mostly yellowish.

F. Leaves viscid beneath: spurs straight or curved outward, very slender. Southeastern Utah and southwestern Colorado. ..... 60. *A. micrantha*

FF. Leaves not viscid beneath: spurs incurved, coarser. Range north of above..... 51. *A. flavescens*

EE. Laminæ 0–6 mm. long; flowers mostly red and yellow.

F. Basal leaves biternate; leaflets 2–5 cm. long: laminæ 1–6 mm. long. Alaska to Montana, Utah, Lower California. . 52. *A. formosa*

FF. Basal leaves mostly triternate.

G. Leaflets grayish, 0.5–3 cm. long, with rounded lobes: laminæ 3–5 mm. long: plants not markedly viscid. Nevada and eastern California..... 53. *A. Shockleyi*

GG. Leaflets green, 1–4 cm. long, with pointed tips to lobes: laminæ lacking: plants viscid. Coastal California..... ..... 54. *A. eximia*

DD. Sepals erect to somewhat divergent, not horizontally spreading, shorter than spurs.

E. The sepals not much longer than laminæ.

F. Leaflets viscid, 8–12 mm. long. Southern Utah..... 60. *A. micrantha*

FF. Leaflets not viscid, 10–35 mm. long. Southeastern Utah to Colorado, New Mexico..... 56. *A. elegantula*

EE. The sepals almost to quite twice the laminæ.

F. Leaves biternate.

G. Sepals about half as long as spurs: stems mostly 1.5–4 dm. high.

H. Leaflets glaucous on both surfaces, 10–15 mm. long: laminæ 4–5 mm. long. Northern Arizona. . 55. *A. desertorum*

HH. Leaflets green above, 10–40 mm. long: laminæ 6–8 mm. long. Eastern United States..... 58. *A. canadensis*

GG. Sepals about three-fourths as long as spurs: stems mostly 4–8 dm. high.

H. Length of sepals 15–20 mm.; spurs 20–24 mm. long. Alleghany Mountains to Arkansas, Iowa, Minnesota..... 58. *A. canadensis* var. *coccinea*

HH. Length of sepals 11–14 mm.; spurs 12–20 mm. long. Manitoba to Minnesota and Nebraska..... ..... 58. *A. canadensis* var. *hybrida*

FF. Leaves largely triternate.

G. Spurs 18–25 mm. long; laminæ 5–8 mm. long; sepals red.

H. Sepals 10–14 mm. long; laminæ 5–6 mm. long. East of Rocky Mountains..... ..... 58. *A. canadensis* vars. *latiuscula* and *australis*

HH. Sepals 12–20 mm. long; laminæ 7–8 mm. long. Arizona and New Mexico..... 57. *A. triternata*

GG. Spurs 35–50 mm. long; laminæ 12–20 mm. long; sepals green. Mexico..... 59. *A. Skinneri*

CC. Flowers erect or nearly so.

D. Leaflets thick, closely clustered, small (5–15 mm. wide).

E. Spurs 8–15 mm. long: follicles glabrous. Montana and northern Wyoming..... 7. *A. Jonesii*

EE. Spurs 25–35 mm. long: follicles pubescent. Southwestern Wyoming to Nevada and southern Utah..... 62. *A. scopulorum*

DD. Leaflets not crowded, normal, mostly larger.

E. Stamens not or scarcely exserted; flowers blue to white or ochroleucous; sepals tending to be blunt. From Grand Canyon, Arizona and northern New Mexico northward.....61. *A. cærulea*

EE. Stamens plainly exserted; sepals tending to be sharp-pointed.

F. Sepals 17 mm. wide: leaves biternate: laminæ 2 cm. long, 1.6 cm. wide. Western Texas.....66. *A. Hinckleyana*

FF. Sepals 5–10 mm. wide.

G. Spurs 15–40 mm. long; sepals 8–20 mm. long.

H. Stamens exserted 3-6 mm.; styles 8-12 mm. long.

I. Leaves viscid, biternate to triternate: sepals mostly white to pale blue or pinkish, 3–6 mm. wide. Southeastern Utah to adjacent Colorado and northwestern Arizona.....60. *A. micrantha*

II. Leaves glabrous to pubescent but not viscid, ternate to biternate: sepals cream to yellow or pink, 5–9 mm. wide. Sierra Nevada of California..63. *A. pubescens*

HH. Stamens exserted 8–10 mm.; styles 15 mm. long; flowers yellow: leaves triternate. Guadalupe Mountains of New Mexico and Texas.....65. *A. Chaplinei*

GG. Spurs 40–150 mm. long; sepals 20–40 mm. long, yellow: leaves triternate.

H. Laminæ 8–16 mm. long; spurs 4–7 cm. long. Arizona and Colorado to Sonora and Chihuahua..64. *A. chrysantha*

HH. Laminæ 15–25 mm. long; spurs 9–15 cm. long. Western Texas to Coahuila and Nuevo Leon.....67. *A. longissima*

1. **Aquilegia ecalcarata** Maxim. Fl. Tangut. xx, t. 8, fig. 12 (1889), not Hort. ex Steud., nor Eastwood. Fig. 2.

Semiaquilegia simulatrix Drumm. & Hutchins. in Kew Bull. 1920, 166.

S. ecalcarata Sprague & Hutchins. op. cit. 1921, 175.

Stems 1–6 dm. high, simple to rather freely branched, 1–2.5 mm. thick near base, more or less densely soft-pubescent throughout, some of the hairs gland-tipped: basal leaves several, membranaceous, in wild plants apparently mostly biternate, in garden plants triternate, green and glabrous above, glaucous and somewhat soft-pubescent beneath; petioles 5–18 cm. long, somewhat pilose; primary petiolules 1–5 cm. long, rather densely pilose, secondary from almost 0 to 2 cm. long; leaflets cuneate-obovate, mostly 1–2.5 cm. long, from less to more wide than long, 2–3-fid from one-third to all their length, the divisions then with few obtuse oblong lobes or teeth 1–3 mm. wide; stem-leaves mostly 1–3, petioled and biternate, passing into the uppermost 1–3-fid bracts 5–18 mm. long and with lanceolate segments: flowers erect or somewhat nodding, wine-color to rich purple, sometimes almost white, on very slender pedicels up to 10 cm. long; sepals spreading, elliptic-oblong, glabrous, obtusish to acute, 12–15 mm. long, 5–6 mm. wide; petals typically quite spurless, to short-saccate at base, the laminæ narrowly oblong, 10–15 mm. long, 4–5 mm. wide, subtruncate; stamens about half as long as petals, the anthers dark, almost round to oblong, about 0.5 mm. long; staminodia 3–4 mm. long, acutish, somewhat crinkled on margins: follicles 4–5, straight, pubescent, perhaps 10 mm. long, with glabrous styles an additional 5–7 mm. long; seeds black and shining.

2. Aquilegia ecalcarata, probably the most primitive species in the genus. Sepal, petal, follicles x 1; uppermost central figure, the staminodium x 2½.

Type locality, province Amdo, eastern Kansu, China. Ranging at altitudes of about 9000–10,000 feet, Szechwan, Kansu, western Hupeh, and probably adjacent Tibet. Specimens seen: Hupeh, *E. H. Wilson 2385;* Kansu, *J. F. Rock 12206, 12945, 12439.*

The generic position of this species has been much discussed. The fact that it hybridizes freely with various species of Aquilegia (and as I write

3. AQUILEGIA NIVALIS to the right, with separate petal, staminodium, and sepal. AQUILEGIA AFGHANICA to the left, with separate petal, sepal, and staminodium.

I have before me hybrids with "*A. vulgaris compacta*" and "*A. californica*" made at the John Innes Horticultural Institution by Miss Brenhilda Schafer and kindly sent me by Professor Edgar Anderson; in both cases well developed almost straight spurs are present; furthermore, the hybrids were quite fertile) would argue for retention in Aquilegia. (See also E. Ulbrich, Notizbl. Bot. Gart. Berlin, x, 867, 1929; Hutchinson, Bot. Mag. t. 9382, 1935; Handel-Mazetti, Act. Hort. Gotoburg. xiii, 45, 1939). On the other hand, the wiry stems and short follicles suggest Isopyrum and indicate a primitive condition.

Handel-Mazetti recognizes forma *semicalcarata* (*Semiaquilegia ecalcarata* f. *semicalcarata*, Schipcz., Not. Syst. Herb. Hort. Ross. v, 54, 1924) with spurs up to 10 mm. long. A specimen answering this description is *R. C. Ching 331* from Hsia Mo K'ou near Lichen, Kansu, with purple flowers having sepals and laminæ subequal, 8–12 mm. long, and spurs 3–7 mm. long. The flowers are on a fruiting specimen and undoubtedly small. A collection from southwestern Szechwan, Mt. Mitzuga, west of Muli Gomba, *J. F. Rock 16050*, with leaflets 2–3 cm. long, purple sepals 2 cm. long, purple laminæ 1.4 cm. long and spurs up to 3 mm. long, might fall in the same category. One wonders whether it does not show influence of being in geographical proximity to *A. Rockii*. Perhaps *A. Rockii* may be intermediate between *A. ecalcarata* and *A. oxysepala* var. *kansuensis*.

True *ecalcarata* is small-flowered and short-follicled and is not to be confused with the larger spurless forms of *A. vulgaris* and *A. cærulea*. According to Boothman (Gard. Chron. ser. 3, lxxxvii, 65, 1930) some of the offerings by nurserymen as *A. ecalcarata* refer to *Isopyrum adoxoides* (*Semiaquilegia adoxoides*), a species with only once-ternate leaves and petals about 5 mm. long. Plants grown at Ithaca from American nurserymen have been true *A. ecalcarata*.

2. **Aquilegia nivalis** Falc. ex Jackson, Ind. Kew. i, 167 (1893). Fig. 3.

A. nivalis Falc. ex Baker, in Gard. Chron. ser. 2, x, 76 (1878), in syn.

A. glauca var. *nivalis* Baker, l. c.

A. vulgaris subsp. *nivalis* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 300 (1893).

A. vulgaris subsp. *nivalis* var. *paradoxa* Brühl, op. cit. 301.

A. vulgaris subsp. *nivalis* var. *saccocentra* Brühl, l. c., probably.

A. vulgaris subsp. *jucunda* Hook. f. & Thoms. Fl. Brit. India, i, 24 (1872), as to plants included.

Caudex very heavy, woody; stems mostly 3–25 cm. high, erect or ascending, 1–2 mm. thick near base, rather densely pubescent (some of

the hairs gland-tipped), mostly simple and 1-flowered: basal leaves biternate, the petioles 3–13 cm. long, glandular-pubescent; primary petiolules 5–30 mm. long, glandular-pubescent, secondary up to 3 mm. long; leaflets thickish in texture, obovate to suborbicular in outline, 5–15 (20) mm. long, about as wide, greenish and glabrous above, paler somewhat glaucous and mostly glabrous beneath, tending to be trifid almost to base, the segments with 2–3 oblong lobes; cauline leaves reduced, ternate, none bracteate: flowers erect to nodding; sepals dark purple, divergent, ovate to oblong-ovate, obtuse to acutish at apex, 22–30 mm. long, 12–15 mm. wide, somewhat puberulent; laminæ very dark purple, about 10–12 mm. long, truncate at summit, somewhat emarginate; spurs from saccate to curved-elongate, then about 3–10 mm. long, purplish; stamens very unequal, the longest scarcely equalling the laminæ; anthers yellow, 1.5 mm. long; staminodia 5–7 mm. long, about 1 mm. wide: carpels 5–6, densely pubescent, about

4. AQUILEGIA PARVIFLORA, the separate staminodium broad and crinkled.

1.5 cm. long, the styles an additional 6–7 mm., more or less pubescent; seeds not seen, said to be shining, black, 1.5 mm. long.

Type locality, Kashmir. Botanical specimens seen: Kashmir, *Stewart 7316*, *14804*, *Stewart* collected August 23, 1922, July 14, 1913, July 28, 1928, *J. F. Duthie* June 27, 1901.

This species is amply distinct in its large solitary short-spurred flowers; the spurs when developed are in the curved group. I have seen no material of Brühl's var. *saccocentra*, for which the description was given as sepals 35–40 mm. long, spurs 3–4 mm. long. Some of Stewart's collections have spurs this long.

The species is not in cultivation.

5. AQUILEGIA SAXIMONTANA to the left, with separate staminodium, follicles, sepal, and petal. AQUILEGIA LARAMIENSIS to the right.

3. **Aquilegia parviflora** Ledeb. in Mém. Acad. Sci. Petersb. v, 544 (1815); Icon. Pl. Fl. Ross. v, t. 408 (1834). Fig. 4.

A. thalictroides Schlecht. in Linnaea, vi, 581 (1831).

Stems 1–6 dm. high, 1–2 (4) mm. thick, glabrous, scarcely branched, usually leafless: basal leaves few, biternate, the petioles glabrous, 4–14 cm. long; primary petiolules 1–4 cm. long, glabrous, the secondary 0–1 cm. long; leaflets subcoriaceous, rounded cuneate-obovate, green and glabrous above, white glaucous and soft-pubescent beneath, 0.7–3 cm. long, commonly with 3 broadly round-oblong lobes, sometimes more, and with somewhat inrolled margin; cauline leaves not usually present, except for 1–3 linear-lobed or lance-oblong-lobed bracts 5–30 mm. long: flowers several, suberect, on pedicels up to 1 dm. long; sepals spreading, ovate or oblong-ovate, lilac-blue to whitish, glabrous, 1.5–2 cm. long, 9–12 mm. wide, obtuse; laminæ obtusely rounded, 3–5 mm. long; spurs strongly curved, 3–5 mm. long, 2–2.5 mm. wide at base; stamens 8–11 mm. long; anthers yellow, 1 mm. long; staminodia 5–6 mm. long, obtuse: follicles 5, finely pilose, 1.3–2.3 cm. long, suberect; styles 6–7 mm. long; seeds shining, almost 2 mm. long.

Type locality, Lena River, Siberia. Range eastern Siberia from north of Yakutsk south to Amur River region. Specimens seen: Siberia, *R. Maack* collected in 1854, *H. Nilsson-Ehle* in 1898, *Dr. Stubendorf*, *S. Korshinsky* in 1891, *Turcz*, *F. Karo 409*; Manchuria, *Maximovitch & Schrank*, *R. Maack 154*.

The peculiar thalictrum-like foliage, small flowers, very short spurs, glabrous stems and pedicels, pubescent glaucous under surface of leaves, northern and eastern range in Siberia—all make this species amply distinct.

Apparently *A. parviflora* is not in cultivation, in this country at least.

4. **Aquilegia saximontana** Rydb. in Gray, Synopt. Fl. N. Amer. i, pt. i, 43 (1895); Rydb. in Contr. U. S. Nat. Herb. iii, 482, pl. 19 (1896); Payson, in Contr. U. S. Nat. Herb. xx, 139 (1918). Fig. 5.

A. brevistyla Auth. for Colorado references.

A. brevistyla var. *leiocarpa* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 319 (1893).

Plant cespitose with immense roots; stems many, 5–25 cm. high, 1.5–2.5 mm. thick, more or less decumbent and diffuse, somewhat branched, completely glabrous except sometimes with a few hairs at the summit of the pedicels, rather leafy: lower leaves biternate, rather thin, green above, somewhat glaucous beneath, glabrous; petioles 3–15 cm. long, glabrous; primary petiolules mostly 1–2 cm. long, secondary petiolules nearly or quite lacking; leaflets round-obovate, 1–1.5 cm. long, cleft to near middle, then with 2–3 round-oblong lobes; cauline leaves often only 1, at base of pedicel: flowers nodding, glabrous; sepals blue, oblong-ovate, obtuse to acute, 9–12 mm. long; laminæ yellowish, oblong, rounded at apex, 7–8 mm. long; spurs blue, hooked, 3–7 mm. long; stamens about as long as laminæ,

anthers yellow, 0.6 mm. long; staminodia 4.5 mm. long, abruptly acute: follicles glabrous or nearly so, barely 1 cm. long; styles about 5 mm. long.

Type locality not given by Rydberg who cites, in the 1896 reference, a number of collections and lists in synonymy *A. vulgaris brevistyla* Gray. At the Gray Herbarium in Gray's hand on the Parry collection of 1861 is written "Aquilegia vulgaris L. var. = brevistyla Hook.", showing Gray was referring back to Hooker's name. Among Rydberg's citations is his own collection from Gray's Peak, August 23, 1895; I propose that this be taken as type. Other collections representative of the species, all from Colorado, are: *E. Hall & J. B. Harbour 23*, *H. N. Patterson* collected in 1875, *C. L. Shear 4632*, *C. C. Parry* in 1861, *M. E. Jones 875*, *C. F. Cox 231*, *F. E. & E. S. Clements 511* and *528*.

Characteristic features of *A. saximontana* are spurs hooked, flowers bicolored, laminæ exceeding spurs, flowers not exceeding leaves, follicles glabrous, styles about 4 mm. long.

Aquilegia saximontana is offered occasionally in the American trade; the one or two specimens I have seen were true to name.

5. **Aquilegia flabellata** Sieb. & Zucc. in Abh. Akad. Muench. ser. 4, ii, 183 (1846). Fig. 6.

A. sibirica var. *flabellata* Finet. & Gagn. in Bull. Soc. Bot. France, li, 412 (1904).

A. flabellata var. *protypica* Takeda, Alpine Fls. Japan, t. 4 (1938).

A. japonica Nakai & Hara, in Bot. Mag. Tokyo, xlix, 7 (1935).

A. spectabilis Lemaire, in Ill. Hort. xi, t. 403 (1864), from seeds from Amur and Saghalin, probably the latter, judging from plate.

A. sibirica var. *spectabilis* Baker, in Gard. Chron. ser. 2, x, 111 (1878), by inference.

A. Fauriei Lévl. & Vant. in Bull. Soc. Bot. France, liii, 389 (1906), not Lévl. 1902.

A. Faurieri spelling by Boothman in Gard. Chron. ser. 3, xcv, 281 (1934).

Stems 1.5–4.5 dm. high, subglabrous to thinly pilose throughout or chiefly above, 2–4 mm. thick near base, mostly 1–3-flowered, sometimes more: basal leaves rather few, biternate or sometimes once-ternate, the petioles subglabrous to quite densely pilose, 5–15 (20) cm. long; primary petiolules 1–5 (6) cm. long, secondary 0–5 mm. long, all more or less pilose; leaflets purple-tinged, cuneate-obovate to wider, glabrous above, glaucous and more or less puberulent and pilose beneath, mostly 1.5–4 cm. long, 2–3-lobed one-third to one-half way, then with 2 or 3 terminal oblong teeth; stem-leaves 1–3, the lower similar but reduced, the upper becoming sessile and passing into the bracts, these lance-oblong, 1–3-lobed, 0.5–3 cm.

6. AQUILEGIA FLABELLATA to the left. AQUILEGIA SIBIRICA to the right; note absence of cauline leaves.

long: pedicels commonly 3–10 cm. long, more or less pilose, with some hairs gland-tipped; flowers nodding; sepals divergent, elliptical to very broadly so, obtuse and somewhat recurved at apex, blue-purple to lilac, mostly 2–3 cm. long, 1.5–2 cm. wide; laminæ oblong, lilac, rounded and pale yellow at tip, 1.3–1.6 cm. long, 7–9 mm. wide; spurs lilac, strongly hooked, 8–20 mm. long, 4–5 mm. wide near base; stamens mostly 2–4 mm. shorter than laminæ, anthers dark, 1.5 mm. long; staminodia 5–8 mm. long: carpels 5–7, quite glabrous at maturity except on inner angle, erect, 1.5–3 cm. long, the styles subglabrous, 5–7 mm. long; seeds black, shining, about 2 mm. long.

Type locality not given by Siebold and Zuccarini. Whether a type specimen is extant I do not know. They do cite in synonomy *A. vulgaris* Thunb. (Fl. Japon. 232, 1784) where it is stated "Crescit in regionibus Iedo," so that the reference is to a northern plant. Representative of *A. flabellata* may be cited: *C. Wright* collected in 1853–56, *Augustinowicz* in 1872, *Albrecht* in 1861, *P. H. Dorsett & W. J. Morse 422*, *K. Shiota 530*.

Material from Honshu seems to be smaller-flowered and smaller-leaved and passes toward *A. Buergeriana* in its narrower sepals and spurs and smaller flowers. So far as I can judge from the description, such plants are *A. akitensis* and *A. flabellata* var. *pumila*. It is to be expected that where *A. Buergeriana* and *A. flabellata* come together some mixing might occur.

A. flabellata var. **pumila** Kudo, in Rept. Exped. Forest Kyushu Imp. Univ. i, 65 (1931).

A. Buergeriana var. *pumila* Huth, in Bull. Herb. Boiss. v, 1090 (1897).

A. flabellata f. *pumila* Kudo, in Rept. Veg. N. Saghal. 129 (1924).

A. akitensis Huth, l. c.

A. sibirica var. *japonica* Rapaics, in Bot. Közlem. viii, 134 (1909), possibly, but no specimens cited.

Stems slender, mostly 1–1.5 dm. high: leaflets 10–15 mm. wide: sepals 15–20 mm. long, 10–13 mm. wide; laminæ 10–12 mm. long; spurs about 13 mm. long: follicles about 13 mm. long.

Type locality "Littora insulæ parvæ Rebunshiri" which is off the northwest coast of Yezo and possibly does not apply to the more southern plant here treated as var. *pumila*. Huth's description was based on *Faurie 7273* which I have not seen. Material studied, all from Honshu: *Tschonoski* in 1864, *H. Takeda* in 1905, *Z. Okada 528*, *U. Faurie 6202*, *S. Hajacava*.

Specimens from Sapporo, Yezo, *S. Arimoto* in 1903 and from Korea, Quelpaert, in herbidis Mallaisan, *Faurie 1726*, are intergrades between the species and var. *pumila*.

Other variants have also been described, the status of which I do not have material to determine. A plant with sepals and laminæ ochroleucous to yellowish from Province Kennan, Korea, has been described as *A. japonica* var. *flavida* Nakai & Hara (Bot. Mag. Tokyo, xlix, 7, 1935; *A.*

akitensis var. *flavida* Nakai, op. cit. xliv, 39, 1930). A double-flowered form, *A. akitensis* var. *globularis* Honda & Kishinami (Bot. Mag. Tokyo, xlvii, 434, 1933; *A. japonica* f. *globularis* Nakai & Hara, op. cit. xlix, 7, 1935) has been described from Mt. Arakawa, province Suruga, Honshu. *A. flabellata* var. *humiliata* Makino (Bot. Mag. Tokyo, xxiv, 141, 1910) was based on a cultivated plant with spur curved under the sepals or slightly protruded above them. I have seen no specimens of these three varieties.

Aquilegia flabellata is a rather popular garden plant. According to the Gardeners' Chronicle (ser. 3, lxxix, 267, 1926) there are three varieties in commerce: (1) the typical *flabellata*, stout, glaucous, 2–4 dm. high, with many lavender-blue flowers, the spurs and petals being creamy-white; (2) var. *alba* Hort. with white flowers, presumably the same as var. *nivea* Hort. (Bot. Mag. t. 8354, 1911); (3) var. *nana* Hort. or *nana-alba* Hort. (Gard. Chron. ser. 3, vi, 503, 1889), compact, 1–2 dm. high, with large white flowers. The first and last of these are common in the American trade. Garden plants that I have seen sold as *A. akitensis* and var. *kurilensis* Hort. and as *A. sachaliensis* Hort. are in part *A. flabellata* and in part *A. Buergeriana*. For the use of *A. flabellata* as a parent of *A. Helenæ* see the discussion under *A. cærulea*. An herbarium specimen of a garden plant grown in England and labelled *A. oxypetala* belongs to *A. flabellata*. Professor Anderson writes that in his experience, *A. flabellata* has a way of persisting in the garden after all others have died out from neglect.

6. **Aquilegia sibirica** Lam. Encyc. i, 150 (1783). Fig. 6.

A. vulgaris var. *sibirica* Linn. Syst. Veg. Ed. 12, 372 (1767).

A. vulgaris var. *daurica* Willd. Sp. Pl. ii, 1246 (1800), according to DC. Prodr. i, 50 (1824).

A. vulgaris var. *speciosa* Ait. Hort. Kew. ii, 247 (1789).

A. sibirica var. *discolor* Ledeb. Fl. Altaica, ii, 296 (1830).

A. speciosa DC. Syst. Nat. i, 336 (1818).

A. bicolor Ehrh. Beitr. vii, 146 (1792).

A. speciosa var. *bicolor* DC. l. c.

A. sibirica var. *bicolor* Regel, Reisen Süd. v Ost-Sibirien ausgeführt durch G. Radde, 63 (1861).

A. speciosa var. *concolor* DC. l. c.

A. sibirica var. *concolor* Ledeb. l. c.

A. sibirica var. *media* Rapaics, in Bot. Közlem. viii, 134 (1909), probably.

A. sibirica var. *ircutiana* Fisch. & Mey. & Avé-Lall. in Ind. Sem. Hort. Petrop. xi, 51 (1846).

Stems 2.5–7 dm. high, glabrous, glaucous, 2–4 mm. thick near base, simple or with 2–3 pedicels at top, leafless except for 1 to few bracts near summit: basal leaves few, ternate or sometimes biternate; petioles glabrous, 5–20 cm. long; petiolules 0.5–3 (6) cm. long; leaflets partly or completely trifid, 1–4 cm. long, orbicular to cuneate-obovate, with few broad rounded-truncate lobes, glabrous and glaucous, somewhat darker above than beneath; floral bracts with 1–3 lance-oblong lobes 0.8–1.5 cm. long: flowers nodding, the sepals broadly elliptical, obtuse, blue to claret, divergent, mostly 2–3 cm. long, 1–1.7 cm. wide; laminæ blue (var. *concolor*) or whitish (var. *discolor*), oblong, rounded at apex, 10–13 mm. long; spurs strongly hooked, blue, 5–15 mm. long, 3–5 mm. wide near base; stamens subequal to laminæ, anthers yellow, about 1.5 mm. long; staminodia 7–9 mm. long: follicles 5, subglabrous, erect, 2–2.5 cm. long; styles 4–5 mm. long; ripe seeds not seen.

Type locality Siberia. Apparently ranging rather widely in Siberia and northern Mongolia, from Semipalatinsk and the Yenisei to Altai and east of Lake Baikal. Specimens seen: Siberia, *W. I. Smirnow 109*, *G. Sumnevicz* collected July 28, 1928, *Schischkin*, *Chilikina & Sumnevicz* July 4, 1931, *Ledebour*, *A. Krystofovic* in 1910, *A. Vinogradova & G. Bakluschin* collected June 13, 1927; Mongolia, *V. Ikonnikov-Galitzky 2189*, *2410*.

Aquilegia sibirica has been much confused with *A. flabellata* but is amply distinct in the leafless stems, glabrous pedicels, more glabrous foliage, tendency to ternate leaves, different range.

Ledebour (Fl. Altaica ii, 296, 1830) speaks of a spurless form in cultivation. Rapaics (Bot. Közlem viii, 134, 1909) has var. *iaponica*, "humilis, caulis efoliata," but cites no specimens. It sounds like true *sibirica*, but coming from Japan may be a small form of *A. flabellata*. At present the name *A. sibirica* is sometimes met in the trade; some plants so offered are *A. oxysepala* var. *Yabeana*. *A. sibirica* var. *rosea flore-pleno* Hort. and var. *rubra flore-pleno* Hort. have also been listed. Boothman (Gard. Chron. ser. 3, xcv, 408, 1934) describes *A. sibirica* var. *hybrida* Hort. as "an attractive plant of garden origin with blue sepals and spurs and white petals." Very much like this was the old *A. Garnieriana* Sweet (Brit. Fl. Gard. ser. 2, v, t. 103, 1833), supposedly a hybrid produced from *A. sibirica* with pollen of *A. vulgaris* by Miss Garnier of Wickham, England. A strain of blue and white double short-spurred columbines is offered by a number of nurseries as *A. bicolor* Hort. There is also a red and white form, *A. bicolor* var. *rubra* Hort. Whether these belong to *A. sibirica* or possibly to *A. vulgaris* I do not know.

7. **Aquilegia Jonesii** Parry, in Amer. Nat. viii, 211 (1874); Payson, in Contr. U. S. Nat. Herb. xx, 150 (1918). Fig. 7.

Stems from a branched cespitose caudex, scape-like, leafless, soft-pubescent, mostly 2–10 cm. high, 1-flowered: leaves in basal tufts, ternate to biternate, subcoriaceous, glaucous and pubescent on both surfaces;

petioles very slender, 2–8 cm. long, pubescent, petiolules up to 5 mm. long; leaflets sessile to confluent, crowded, rounded, 5–10 mm. wide, deeply cleft into 3 or 4 rather narrow oblong segments: flowers erect, somewhat pubescent; sepals blue or purple, oblong-elliptic, obtuse, 17–20 mm. long, 8–9 mm. wide; laminæ blue, 8–10 mm. long, subtruncate; spurs straightish, blue, 8–15 mm. long, 3–4 mm. wide at base, rather abruptly narrowed to slender tip which is very little swollen at the gland; stamens about equal to laminæ, anthers yellowish, about 1 mm. long; true staminodia apparently lacking, the inner stamens with much dilated filaments, but antheriferous: follicles 5–6, glabrous, glaucous, 14–22 mm. long, suberect, the glabrous styles about 12 mm. long; seeds about 2 mm. long.

Type locality, Phlox Mountain, northern Wyoming. Apparently an inhabitant of rocky calcareous places at 7000–10,000 feet elevation, from near the Canadian border through Glacier National Park (Montana) to

7. AQUILEGIA JONESII to the left; innermost stamen shown above. AQUILEGIA SCOPULORUM to the right; staminodium well developed.

northern Wyoming. Named for Capt. W. A. Jones who led an expedition into northwestern Wyoming in 1873. Representative collections are: Alberta, *J. Macoun 10029;* Montana, *W. M. Canby 13, Standley 16412, 18123, 15766, 17268, V. Bailey* in 1917, *A. S. Pease 22154, M. P. Somes 44, J. H. Flodman 451, R. S. Williams 764;* Wyoming, *L. Williams 2358, L. O. & R. Williams 3219, F. Tweedy 177, C. C. Parry 3.*

The species is characterized by its erect solitary flowers, short spurs, leafless stems, coriaceous small crowded leaflets, lack of staminodia, glaucous glabrous follicles. Payson thinks this species is near *A. cærulea* but it seems to me, in its scapose habit, short spurs and included stamens and glabrous follicles, to be nearer Asiatic plants. The lack of staminodia is of course not an Aquilegia character, but would suggest affinity with the Paraquilegia-Isopyrum complex.

A. Jonesii var. **elatior** Boothman, in Gard. Chron. ser. 3, xcv, 352 (1934).

A. Jonesii subsp. *elatior* Standley, in Contr. U. S. Nat. Herb. xxii, 340 (1921).

Stems 1–2 dm. high, sometimes 2-flowered, less pubescent, more green; leaflets less crowded.

Specimens seen: Montana, Glacier National Park, *Standley 15765* (type), *16407, H. N. Evans* collected July 24, 1924.

Aquilegia Jonesii is offered by a few dealers and is suitable for alpine gardens.

8. **Aquilegia laramiensis** A. Nelson, First Rept. Fl. Wyo. 78 (1896); Payson, in Contr. U. S. Nat. Herb. xx, 140 (1918). Fig. 5.

Plant cespitose; stems many, 5–25 cm. high, 1.5–2.5 mm. thick, more or less decumbent and diffuse, somewhat branched, glabrous below, somewhat pilose above, rather leafy: lower leaves biternate, rather thin, green above, somewhat glaucous beneath, glabrous to pilose on both surfaces; petioles 3–15 cm. long, glabrous; primary petiolules up to 3 cm. long, glabrous, secondary somewhat shorter; leaflets round-obovate, 1–2.5 cm. long, cleft to near middle, then with 2–3 round-oblong lobes; cauline leaves mostly well developed so that the flowers are among leaves: flowers nodding, nearly or quite glabrous; sepals greenish-white, divaricate, lanceolate, acute, 10–15 mm. long; laminæ cream-colored, oblong, rounded at apex, 10–12 mm. long; spurs white, hooked, 5–8 mm. long, about 2.5 mm. wide at base; stamens about as long as laminæ, anthers yellow, 6 mm. long; staminodia 4.5 mm. long, slightly crinkled, abruptly acute: follicles pilose, 1–1.4 cm. long, slightly spreading at tips; styles about 5 mm. long; seeds slightly over 1 mm. long.

Type locality foot of Laramie Peak, Laramie Range, Albany County, Wyoming. Specimens seen, all from Wyoming: *A. Nelson 1581, 7505, E. B. & L. B. Payson 4683.*

The species is distinguished by whitish flowers, hooked spurs shorter than the laminæ, stems low, leafy to summit.

I have not seen this species listed in nursery catalogues.

9. **Aquilegia brevistyla** Hook. Fl. Bor.-Amer. i, 24 (1829); Payson, in Contr. U. S. Nat. Herb. xx, 139 (1918). Fig. 8.

A. vulgaris var. *brevistyla* Gray, in Amer. Journ. Sci. ser. 2, xxxiii, 243 (1862).

A. brevistyla var. *vera* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 319 (1893).

A. brevistyla var. *altior* Rapaics, in Bot. Közlem. viii, 132 (1909).

Stems 2–8 dm. high, 1.5–3.5 mm. thick, glabrous to pilose below, pilose and more or less glandular above, simple to branched above: basal leaves few, biternate, rather thin, green and glabrous above, glaucous and glabrous to pilose beneath; petioles 3–18 cm. long, slender, subglabrous to

8. AQUILEGIA BREVISTYLA; note short styles as compared to length of follicles.

pilose; primary petiolules 1–5 cm. long, usually pilose, secondary up to 1 cm. long; leaflets round-obovate to wider, 1–4 cm. long, cleft to about the middle, each division with few round-oblong often slightly emarginate lobes; cauline leaves gradually reduced up the stem, the leaflets narrower, upper bracteose, with 1–3 lanceolate lobes 0.5–2.5 cm. long: pedicels up to about 1 dm. long; flowers nodding, pilose; sepals blue, slightly spreading, lanceolate, acuminate to acute, 13–16 mm. long; laminæ yellowish-white, oblong, rounded-truncate, 8–10 mm. long; spurs blue, hooked, 6–7 mm. long, about 3 mm. wide at base; stamens scarcely equalling laminæ, anthers yellow, about 1 mm. long; staminodia 6–7 mm. long, plane, abruptly acute: follicles 5–6, glandular and pilose, 15–25 mm. long, often divergent above, the styles 3–4 mm. long; seeds about 1.5 mm. long.

Type locality, "W. parts of Canada." Ranging from southern Alaska to Northwest Territory and south to British Columbia, Manitoba and South Dakota. Representative collections are as follows: Alaska, *J. P. Anderson 6938, L. J. Palmer 1824, C. W. H. Heideman 25;* Yukon, *A. Eastwood 602, 293, M. W. Gorman 1049, J. B. Tarleton 91b, J. Macoun 58334, R. S. Williams* collected August 20, 1899; Northwest Territory, *Miss E. Taylor* July 11, 1892; British Columbia, *H. M. Raup & E. C. Abbe 3722, 3619, E. A. Preble & G. Mixter 600, T. Ulke 1159;* Alberta, *Marion E. Moodie 981, Raup & Abbe 4642, J. M. Macoun 95891, 95892, 95893, 95894, W. C. McCalla 2107;* Saskatchewan, *Raup 6239, 6465, 6369, 6276;* Manitoba, *E. Scamman 2885;* South Dakota, *J. Murdoch Jr. 3001, H. E. Hayward 1816, 1073, 1447, Rydberg 503.*

Aquilegia brevistyla is characterized by blue and white flowers, hooked spurs which are shorter than the laminæ, stamens included, and short styles. It is of course nearer to Asiatic than other American species except possibly *A. saximontana* and *A. laramiensis*, both of which have the stems shorter and the flowers in among the leaves.

The name *brevistyla* is occasionally met in the trade. I have seen no cultivated specimens which I could check as to identification.

10. **Aquilegia Litardierei** Briquet, Prodr. Fl. Corse, i, 589 (1910).

A. Bernardi var. *minor* Lit. in Bull. Acad. Géogr. Bot. xviii, 118 (1909).

Stems weak, ascending, about 12 cm. high, simple, scapiform, glabrous below, sparsely pilose above: basal leaves ternate; petioles 3–6 cm. long, somewhat pilose; petiolules 0.7–1.5 cm. long; leaflets broadly obcordate, 1 cm. long, deeply 3-fid, with few wide crenate lobes which are rounded or obtuse, subglabrous and green above, sparsely short-pilose and paler beneath; cauline leaves reduced, the lower short-petioled, trilobed, upper bracteate: flowers violet-blue, puberulent without, nodding; sepals divergent, ovate-elliptic, 14 mm. long, 7 mm. wide; laminæ broadly obovate, rounded, about 12 mm. long, 7 mm. wide; spurs hooked, up to 8 mm. long; stamens slightly exserted; anthers yellow, 1 mm. long; staminodia crinkled on margins, acutish: follicles 5, puberulent, with glabrous styles.

9. AQUILEGIA ULLEPITSCHII, upper left. AQUILEGIA VISCOSA, lower right, with sepal, petal, and staminodium drawn separately.

"Mt. Incudine, sur le versant du Fiumorbo," Corsica. Restricted to Corsica, set apart with *A. Paui* by the ternate leaves and differing from that Spanish species by fairly good floral characters. No specimens have been seen.

This species is not in cultivation.

11. **Aquilegia Paui** FontQuer, in Treb. Mus. Ciènc. Nat. Barcelona, v, ser. bot. no. 3, 198 (1920).

Stems 8–15 cm. high, simple or branched below, glandular-pubescent throughout: basal leaves ternate, the leaflets 1–2 cm. long, 3-parted or 3-fid, the segments unequally round-lobed, pale green above, glaucous and more or less glandular-pilose beneath; cauline leaves smaller, 1–3 in number: flowers 1–3, pale blue to white; sepals elliptic-lanceolate, 10 mm. long; laminæ rounded-truncate, somewhat emarginate, 9 mm. long, 5 mm. wide; spurs curved, 6.5 mm. long; stamens equalling or slightly shorter than laminæ, anthers yellow; staminodia acute: follicles 10 mm. long, the styles an added 3.5 mm.

Type locality, Ports de Tortosa, at 3700–4400 feet altitude. Growing in calcareous soils in western Catalonia, Spain.

This species is not in cultivation.

12. **Aquilegia Ullepitschii** F. Pax, Gr. Pflanzenverbr. Karp. ii, 52 (1908); Hayek, Pflanzend. Oesterr.-Ung. i, 383 (1915); Javorka & Csapody, Icon. Fl. Hungar. 160 (1930). Fig. 9.

Stems 1–2 dm. high, glabrous below, more or less viscid-glandular above, 1–2-flowered: basal leaves ternate, the petioles about 3–6 cm. long, pilose; petiolules 5–15 mm. long; leaflets about 1 cm. long, trifid or tripartite, the divisions cuneate-obovate, shallowly lobed, green and glabrous above, somewhat pilose and glaucous beneath; cauline leaf much reduced, short-petioled; lower floral bracts trifid, sessile: flowers dark blue-violet, nodding; sepals spreading, lance-ovate, obtusish, glandular-pubescent, about 3 cm. long, 1 cm. wide; laminæ rounded-truncate, 3 cm. long or longer; spurs hooked, 1.5 cm. long, pubescent, about 5 mm. wide near base; stamens exserted 1–2 mm.; ovary pubescent.

From "Pienen: Kronenberg," in the Carpathian Mountains. The collection made in Monte Kronenberg, Carpathia, Galicia, Austria, June 1891, by *J. Ullepitsch 2704* as *A. viscosa* seems this. It differs from the other ternate-leaved species of southern Europe by its low stature and dark flowers and small leaflets. The species is not in the trade.

13. **Aquilegia glandulosa** Fisch. ex Link, Enum. Hort. Berol. ii, 84 (1822). Fig. 10.

A. vulgaris var. *grandiflora* Walp. Ann. iv, 25 (1857).

A. vulgaris subsp. *glandulosa* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 302 (1893).

A. vulgaris subsp. *glandulosa* var. *vera* Brühl, op. cit. 303.

A. alpina var. *grandiflora* DC. Syst. Nat. i, 337 (1818).

A. grandiflora Patrin ex DC. l.c. pro syn.; Schangin, in Pall. N. Nord. Beitr. vi, 49 (1793).

A. glandulosa var. *concolor* DC. Prodr. i, 50 (1824).

A. glandulosa var. *discolor* DC. l. c.; Steud. Nom. Ed. 2, i, 115 (1840).

A. jucunda Fisch. & Avé-Lall. in Ind. Sem. Hort. Petrop. vi, 43 (1840).

A. glandulosa var. *jucunda* Baker, in Gard. Chron. ser. 2, x, 203 (1878).

A. vulgaris subsp. *jucunda* Hook. f. & Thoms. Fl. Brit. India, i, 24 (1872) as to name.

A. vulgaris subsp. *glandulosa* var. *jucunda* Brühl, op. cit. 302.

A. Gebleri Besser ex Turcz. in Flora, xvii, Beibl. i, 5 (1834) nomen, possibly.

A. vulgaris subsp. *glandulosa* var. *Gebleri* Besser? ex Brühl, op. cit. 303.

Stems 1–4 (6) dm. high, 1–5-flowered, glaucous, 1.5–3 mm. thick and subglabrous below, glandular-pilose upward, leafless except for upper bracts or with 1 leaf: basal leaves few to several, mostly biternate, the petioles 5–20 cm. long, more or less pilose; primary petiolules 1–4 cm. long, somewhat glandular-pilose, secondary 0–1 cm. long; leaflets close together or partly adnate, orbicular-obovate or wider, glaucous, glabrous above, paler and scattered-pilose beneath, 1–3.5 cm. long, generally 2–3-lobed to near middle, then further few-toothed with oblong rounded teeth; cauline leaf, if present, shorter-petioled and reduced, upper bracts lanceolate to lance-oblong, 1–3-lobed, 8–22 mm. long: pedicels 2–10 cm. long; flowers suberect; sepals spreading, broadly ovate to elliptic-ovate, lilac-blue, 2–4.5 cm. long, 1.5–2.5 cm. wide, obtuse to acutish, ciliate; laminæ elliptic-obovate to -oblong, rounded to obtusish at apex, violet-blue to white, 1.5–2.5 cm. long, 1–1.5 cm. wide; spurs strongly hooked, 5–12 mm. long, bluish, 3–4 mm. wide at base; stamens 2–10 mm. shorter than laminæ, anthers yellow, 1.5–2 mm. long; staminodia 6–7 mm. long: follicles 6–12, glandular-pilose, 2–3 cm. long; style hairy, 6–7 mm. long; seeds black, shining.

Type locality, "Sibiria altaica"?, not stated in Link. Range south-central Siberia and coinciding roughly with that of *A. sibirica*, from which it differs in the glandular-pilose upper stems, more narrowly lobed leaflets, hairy follicles, larger flowers. Whether the two species actually occupy the same areas I lack adequate material to determine; some labels would indicate that *sibirica* is in woods and *glandulosa* near timber line. I lack adequate material also to separate the var. *discolor* (*jucunda*) from *glandu-*

10. Aquilegia glandulosa, a Siberian columbine with extraordinarily broad sepals and laminæ.

losa; the former is supposed to have smaller flowers, stamens more nearly reaching top of laminæ, laminæ white, sepals bluish. Representative collections of *A. glandulosa* are: *Krylov & Sergievskaja* collected July 30, 1928, *Karelin & Kiriloff* in 1840, *Gontscharov & Borissona 508, P. Krylov* June 11, 1901, *F. N. Meyer 850, W. I. Smirnow 2448.*

Aquilegia glandulosa seems to have been in cultivation for about a century. An article in Gardener's Chronicle, ser. 3, xxvii, 423, 1900, on "Plants of the Victorian Era" mentions its use as early as about 1840. At present it is listed in many catalogues, as *A. glandulosa* and *A. glandulosa vera.* Some such material is definitely incorrectly named, having laminæ entirely too short and being nearer to *A. vulgaris* in appearance. Var. *major* Hort. and var. *rosea* Hort. are listed names, of which I have not seen plants. *A. jucunda* or *A. glandulosa* var. *jucunda,* the bicolored form of *A. glandulosa,* is also in the trade, some plants being correctly named and others being nearer to *A. vulgaris* var. *nivea.*

Aquilegia Stuartii Balf. f. (*A. glandulosa* var. *Stuartii* Hort.) is a hybrid produced in 1880 by Dr. C. Stuart of Scotland, who used pollen of *A. glandulosa* on *A. Wittmanniana* (*A. olympica* in this paper). It was reported as hardy, true from seed, early to flower;* the name was suggested by Balfour. The habit is low, the flowers up to about 1 dm. across, with sepals violet-blue and petals white-tipped. It seems to be listed by foreign firms only.

14. **Aquilegia transsilvanica** Schur, in Verh. Siebenb. Ver. Naturw. iv, 31 (1853). Fig. 11.

A. vulgaris var. *transsilvanica* Baker, in Gard. Chron. ser. 2, x, 76 (1878).

A. vulgaris subsp. *glandulosa* var. *transsylvanica* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 303 (1893).

A. paraplesia Schur, Enum. Pl. Transsilv. 28 (1866).

A. vulgaris var. *paraplesia* Baker, l. c.

A. Fussii Zimmeter, Verw.-Verh. Eur. Aquil. 41 (1875).

Stems 1.5–4.5 dm. high, 2–3 mm. thick, subglabrous below, somewhat pilose above, 1–3-flowered: basal leaves membranous, biternate, the petioles slender, slightly pilose upward, up to 1 dm. long; primary petiolules 1–2 cm. long, pilose; leaflets subsessile, cuneate-obovate, 1–2 cm. long, as wide or wider, green and glabrous above, paler and only slightly pubescent beneath, 2–3-cleft to about the middle, then rather deeply 2–3-lobed with oblong segments mostly 1–2.5 mm. wide; petioled cauline leaves apparently mostly lacking, bract-like leaves 1–3-lobed, subsessile, 1–2 cm. long: pedicels short; flowers somewhat nodding, blue with violet tinge;

*Garden, xxxiv, 344 (1888); Rev. Hort. lx, 539 (1889); Journ. Roy. Hort. Soc. xxvi, 285 (1900).

11. Aquilegia transsilvanica to the left. Aquilegia aurea to the right.

sepals spreading, elliptic-ovate, 3–4 cm. long, 1.6–2.2 cm. wide, rounded at apex, glabrous; laminæ elliptic-ovate, with rounded apex, 2–2.4 cm. long, about 1 cm. wide; spurs curved but not hooked, about 1 cm. long, 2.5–3 mm. wide at base; stamens about 1 cm. shorter than laminæ, anthers yellow, 1.5 mm. long; staminodia almost plane, acute, 7 mm. long: follicles pubescent, said to be more than 5, not seen in maturity.

Known from elevations of 5000–7500 feet in Siebenbürgen, Transsylvania (eastern Hungary). The only specimen seen was *E. I. Nyárády 1230.* The plant is doubtfully specifically distinct from the Siberian *A. glandulosa* and the single specimen seen is not enough for definite decision. The leaves seem less pubescent, the spurs less hooked and more slender at the base, sepals more rounded at apex.

Aquilegia transsilvanica (often spelled *transylvanica*) is listed by several American firms. Such of their material as I have seen was near *A. vulgaris* var. *nivea* with creamy flowers and hooked spurs.

15. **Aquilegia pubiflora** Wall. Cat. no. 4714 (130), nomen; ex Royle, Ill. Bot. Himal. i, 55 (1834). Fig. 12.

A. vulgaris var. *pubiflora* Walp. Ann. iv, 25 (1857).

A. vulgaris subsp. *pubiflora* Hook. f. & Thoms. Fl. Brit. India, i, 24 (1872); Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 310 (1893).

A. vulgaris subsp. *pubiflora* var. *subnuda* Brühl, l. c.

Stems 1.5–7 dm. high, very slender, mostly 1–1.5 mm. thick, sometimes up to 3 mm., finely and sparingly pilose throughout, more densely so in inflorescence, open- and few-branched above: leaves green and glabrous above, somewhat paler and pilose beneath; basal leaves usually biternate, on petioles up to about 15 cm. long; primary petiolules 1–5 cm. long, secondary 0.1–2 cm. long; petioles and petiolules sparsely pilose; leaflets thin, round-obovate in outline, 8–30 mm. long, almost as wide, mostly 3-fid half way (or more) to the base, each segment with 2–5 oblong lobes or teeth; cauline leaves usually 2 or more, much like basal but somewhat reduced, the uppermost with 1–3 linear to lance-elliptic lobes: flowers 2-several, acending, on pedicels 2–10 cm. long; sepals ovate-lanceolate, spreading, long-acuminate, puberulent without and somewhat within, 18–28 mm. long, 7–9 mm. wide, of deep wine-color to purplish-blue; petals of same color, the laminæ oblong-obovate, mostly apically rounded, somewhat puberulent, 10–15 mm. long, the spurs of same color, strongly hooked, 5–12 mm. long, about 7–9 mm. wide near base; stamens 12–14 mm. long, anthers dark, 1–1.5 mm. long; staminodia 5–6 mm. long: carpels 5–6, the ovaries densely pubescent, styles not exserted in anthesis; follicles 18–20 mm. long, erect or somewhat spreading, pubescent, with hooked pubescent styles an additional 7–8 mm. long; seeds black, shining, almost 2 mm. long.

Type locality "Srinaghar et Bhuddrenak," Kashmir. Occurring in the outer ranges of the Himalayas, in Kashmir and Punjab. Representative

specimens of *A. pubiflora* are: Kashmir, *R. S. Stewart 7904, 9249a, 9215, 9169, 4675, 13997, 14065, R. R. & I. D. Stewart 17725, 17897;* Punjab, *W. Koelz 8653, R. R. Stewart 2049, 10268, M. Nath 47, T. Thomson, R. N. Parker 2992, J. R. Drummond 6280.*

Aquilegia pubiflora differs from *A. glandulosa* and *A. transsilvanica* by its narrower sepals and shorter laminæ. Its more oblong staminodia, wider laminæ, narrower sepals, thicker spurs, smaller and more divided leaves all separate it from the European *A. vulgaris* to which it has often been referred as a variety.

A. pubiflora var. **mussooriensis** Royle, Ill. Bot. Himal. i, 55 (1834). Fig. 12.

A. vulgaris subsp. *pubiflora* var. *massuriensis* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 311 (1893).

Probably var. *Cunninghami* Brühl, l. c. (no material seen, but dimensions as given and range, Himalaya pentapotamica, would put it here or intermediate between *pubiflora* and *fragrans*.)

Flowers yellowish to blue or purple; sepals 15–16 mm. long, acutish; laminæ 11–12 mm. long; spurs 4–7 mm. long: follicles 13–15 mm. long; styles 5–7 mm. long.

Type locality, Mussooree Range, northern India. Representative specimens: *R. R. Stewart 9115, 10220a, 13898, 3923, 9097, R. N. Parker 2787, W. Koelz 1465, 179, Strachey-Winterbottom 2, Biskam 2284.*

Apparently where the range of *A. pubiflora* overlaps that of *A. fragrans* are plants partaking of characters of both, with leaflets rather small (as in *pubiflora*), sepals near 3 cm. long (*fragrans*), subacuminate (*pubiflora*), spurs about 1.2 cm. long (*fragrans*), hooked (*pubiflora*). Such intergrades are exemplified by the following collections from Kashmir: *R. R. Stewart* collected July 1927, *Stewart 12208, W. Koelz 5997, J. E. Winterbottom 419* (var. *Winterbottomiana* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 309, 1893).

The name *A. pubiflora* does not seem to be in the American trade, but some plants offered as *A. glauca* and *A. suaveolens* have sufficiently hooked spurs to belong rather to *A. pubiflora* than to the names under which they are listed.

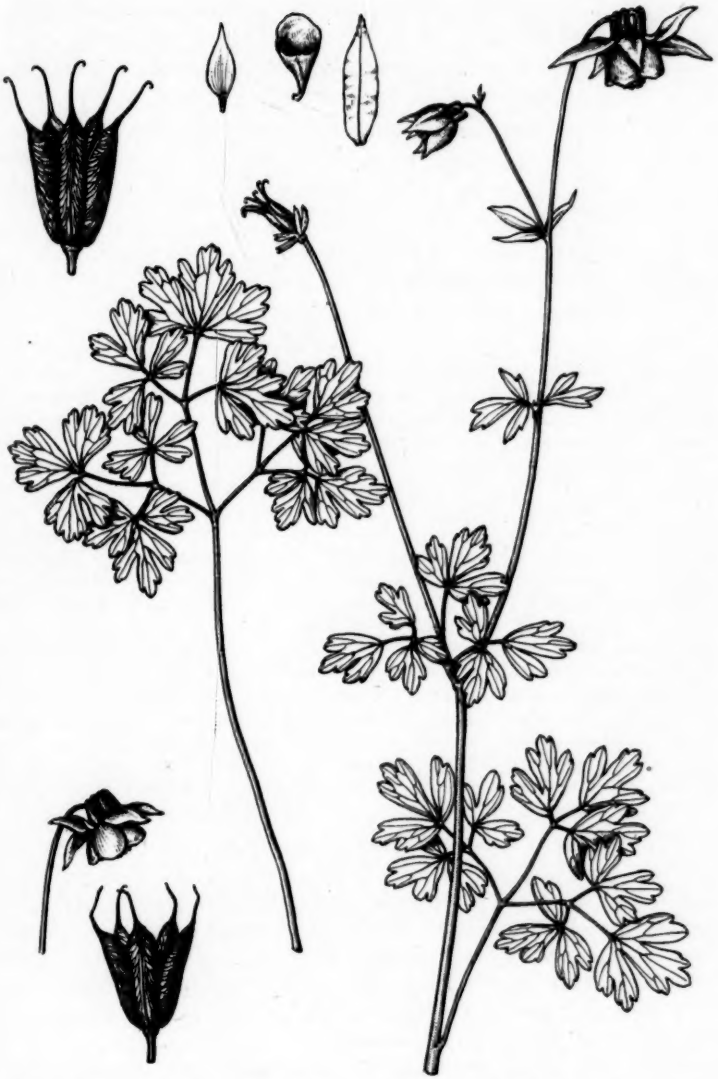
16. **Aquilegia vulgaris** Linn. Sp. Pl. 533 (1753). Fig. 13.

A. vulgaris subsp. *vulgaris* Briquet, in Prodr. Fl. Corse, i, 583 (1910).

A. vulgaris var. *typica* Beck, Fl. Nieder-Oesterr. i, 400 (1890).

A. vulgaris var. *normalis* Walp. Ann. iv, 25 (1857).

A. vulgaris var. *varia* Neilr. Fl. Nieder-Oesterr. 695 (1859).



12. AQUILEGIA PUBIFLORA, with follicles, sepal, petal, and staminodium above. Flower and fruit of var. MUSSOORIENSIS at lower left.

A. vulgaris var. *pratensis* Kittel, Taschenb. Fl. Deutschl. Ed. 3, 868 (1853).

A. vulgaris var. *genuina* Rouy & Fouc. Fl. France, i, 124 (1893).

A. vulgaris f. *cornuta* Rapaics, in Bot. Közlem. viii, 134 (1909).

A. silvestris Neck. in Delic. Gallo-Belg. i, 234 (1768).

A. versicolor Salisb. Prodr. 374 (1796).

A. cornuta Gilib. Fl. Lituan. ii, 286 (1781).

A. glaucophylla Steud. in Flora, xxxix, 407 (1856); from Chile, said to be *A. vulgaris* by Baker, in Gard. Chron. ser. 2, x, 76 (1878) who printed it *glaucescens* on page 203.

A. elegans Pope ex Steud. Nom. Ed. 2, i, 115 (1840).

Stems mostly 3–6 dm. high, 3–5 mm. thick below, subglabrous to scattered-pilose below, more densely pilose but usually not glandular above, commonly branched above: basal leaves well developed, biternate, the petioles 5–18 cm. long, pilose; primary petiolules 2–4 (7) cm. long, pilose, secondary petiolules 2–15 (30) mm. long; leaflets orbicular-ovate to -obovate, thin, green and glabrous above, glaucous and more or less pilose beneath, 1.5–3 (5) cm. long, sometimes wider, 2–3-fid to one-third or one-half their length, then with 2–3 rounded oblong lobes 4–6 mm. wide; petioled cauline leaves usually present, somewhat reduced and passing upwards into simple or 3- or more-lobed bracts 1–4 cm. long, the lobes commonly oblong-elliptic, 3–15 mm. wide: flowers nodding, few to many, on pedicels up to 15 cm. long, mostly violet, sometimes rose to white; sepals spreading, lance-ovate, abruptly acute to obtuse, 18–25 mm. long, 10–12 mm. wide, more or less pubescent on outside and toward tips; laminæ of same color as sepals, oblong-obovate, rounded-truncate, 10–13 mm. long, 9–12 mm. wide; spurs strongly hooked, 1.5–2.2 cm. long, 7–9 mm. wide near base, pubescent; stamens about as long as laminæ or up to 2 or 3 mm. longer, anthers yellow to dark, 1–1.5 mm. long; staminodia about 7 mm. long, somewhat crinkled, rather blunt at apex: follicles mostly 5, erect, densely glandular-pubescent, 15–25 mm. long, the subglabrous styles about 7 mm. longer; seeds black, shining, 2.2–2.5 mm. long.

Type locality, "Habitat in Europæ nemoribus saxosis." Range from southern Scandinavia to western Russia, Austria, Serbia, Bosnia, Italy and Spain, England. Representative of *A. vulgaris* may be cited: England, *L. Rotheray* collected June 12, 1889, *Ward* in 1836; Holland, *C. T. Femstra* June 1, 1903; France, *Jeanpert* July 31, 1898, *E. Cosson* May 26, 1837, *Lassimonne* June 1890; Italy, *J. Ball* in 1844; Germany, *Theinmann* June 1882, *Reineck* June 1907, *Schott* May 1849; Russia, *L. Gruner* June 2, 1860; Norway, *R. E. Fridtz 25994;* Sweden, *G. A. Ringselle* June 18, 1911, *C. A. Lindblom* June 1886, *Oldberg* June 1868; Finland, *H. Forsblom, W. Wegelius & H. Hjelt 213;* Switzerland, *Fauconnet, Louis & Emile Gross.* Naturalized in America: Newfoundland, *Fernald & Wiegand 5452, Agnes M. Ayre 603;* Prince Edward Island, *Fernald, Long & St. John 7499;* Nova Scotia,

13. AQUILEGIA VULGARIS. At extreme upper right petal and sepal of var. NEMORALIS; just below, petal and sepal of var. SUBALPINA.

Fernald & Long 21266, 23861; Quebec, *A. S. Pease 2481, 560;* Ohio, *J. A. Drushel 7698;* Vermont, *J. S. Harper 25;* New York, *Eames & MacDaniels 514a;* Pennsylvania, *L. F. Randolph 60.*

I am interpreting *A. vulgaris* in the sense of European writers and forgetting the Linnæan specimen 699–5, which Jackson says is labelled in Linnæus' hand and was in his herbarium in 1753 and which according to the catalogue accompanying the set of photographs at the Arnold Arboretum came from Siberia. Actually, although a poor photograph, it looks more like *A. flabellata* than *A. vulgaris*, having very heavy stem, wide blunt sepals.

Key to the varieties of *A. vulgaris*:*

A. Flowers spurless.....v. var. *stellata*
AA. Flowers spurred.
B. The flowers white.....o. var. *nivea*
BB. The flowers colored.
C. Pedicels glabrous to pubescent, but not glandular.
D. Whole plant (including carpels) glabrous.....h. var. *glabella*
DD. Whole plant more or less pubescent.
E. Sepals 30–32 mm. long. Haute-Garonne, France.....b. var. *arbascensis*
EE. Sepals 18–28 mm. long.
F. Leaves biternate.
G. Sepals broadly ovate, obtuse. Infrequent, but widespread.
.....r. var. *platysepala*
GG. Sepals narrow-ovate, more pointed.
H. The sepals 20–28 mm. long: leaflets mostly 2–4 cm. long. Widespread.....*A. vulgaris*
HH. The sepals 15–20 mm. long: leaflets 1–2.5 cm. long.
I. Length of sepals 15–18 mm.; spurs 12–14 mm. long. France and western Switzerland.....n. var. *nemoralis*
II. Length of sepals 18–20 mm.; spurs 8–10 mm. long. Tyrol, Styria, Carniola, etc.....q. var. *parviflora*
FF. Leaves otherwise: sepals 20–25 mm. long.
G. Foliage ternate. Lower Austria and Bosnia.....p. var. *notabilis*
GG. Foliage almost triternate. Bosnia and Hercegovina..k. var. *incisa*
CC. Pedicels with some hairs gland-tipped.
D. Leaves subtomentose beneath. Bohemia.....x. var. *subtomentosa*
DD. Leaves less hairy.
E. Sepals 3–4 cm. long.
F. Length of sepals 3–3.2 cm.: leaflets pubescent beneath. France.....w. var. *subalpina*
FF. Length of sepals 3.8 cm.: leaflets glabrous. Hungary.....
.....l. var. *longisepala*
EE. Sepals shorter.
F. Laminæ more or less rounded at apex.
G. Stems 1–4-flowered.
H. Leaflets rounded, 1–2 cm. long.

*In addition to these keyed varieties, which are arranged alphabetically for discussion, there are several others for which not definite enough information is available to enter them in the key. For brief discussion of these, see the paragraphs immediately following the keyed varieties.

I. The leaflets deeply incised-crenulate. Southeastern France.....a. var. *aggericola*

II. The leaflets shallowly incised-crenulate. Pyrenees. .....g. var. *eynensis*

HH. Leaflets broadly obovate, 2–3 cm. long. Sicily...u. var. *sicula*

GG. Stems several-flowered.

H. Leaves, as well as stems and pedicels, glandular-pilose. Balkans.....i. var. *glanduloso-pilosa*

HH. Leaves not glandular-pilose.

I. The stems glandular-pubescent: sepals 25 mm. long: follicle-group broadly rounded at base. Corsica. .....f. var. *dumeticola*

II. The stems not glandular below the pedicels. France.

J. Group of follicles narrowed at base: flowers lilac; sepals scarcely exceeding petals.....s. var. *præcox*

JJ. Group of follicles rounded at base: flowers violet; sepals much longer than petals.....d. var. *collina*

FF. Laminæ definitely truncate.

G. Spurs saccate, definitely shorter than laminæ. Southwestern France.....e. var. *cyclophylla*

GG. Spurs tubular, longer than laminæ.

H. Leaves pubescent on both surfaces. Spain...j. var. *hispanica*

HH. Leaves pubescent beneath only.

I. Follicle-group rounded at base: lobes of leaves divaricate, with broad sinuses.

J. Sepals 16 mm. long, blue; spurs much longer than laminæ; styles short in fruit. Eastern Pyrenees. .....t. var. *ruscinonensis*

JJ. Sepals 25 mm. long, whitish; spurs not much longer than laminæ; styles long in fruit. Morocco.....c. var. *Ballii*

II. Follicle-group narrowed at base: lobes of leaves not divaricate, with narrow sinuses. Southwestern France.....m. var. *mollis*

a. **A. vulgaris** var. **aggericola** Richter-Gürke, Pl. Eur. ii, 421 (1903).

A. vulgaris f. *aggericola* Rouy & Foue. Fl. France, i, 124, 126 (1893).

A. aggericola Jord. Diagn. i, 87 (1864).

Stems densely viscid-pubescent, 1–4-flowered: leaflets small, rounded, deeply incised-crenulate: flowers blue; sepals elliptic-ovate; laminæ rounded, almost as long as sepals.

Type locality, "Mont-de-Lure, Basses-Alpes," the variety being found in Drôme and Isère, France. No specimens have been seen.

b. **A. vulgaris** var. **arbascensis** Gürke in Richter-Gürke, Pl. Eur. ii, 421 (1903).

A. vulgaris f. *arbascensis* Rouy & Foue. Fl. France, i, 124, 125 (1893).

A. arbascensis Timb.-Lagr. in Bull. Soc. Sci. Phys. Nat. Toulouse, ii, 449 (1874).

A. speciosa Timb. in Bull. Soc. Hist. Nat. Toulouse, iv, 155 (1870).

Sepals 3–3.2 cm. long, oval, obtuse. Near to var. *subalpina* in large size, large flowers, etc. but not at all glandular.

Department Haute-Garonne, southern France. No specimens have been seen.

c. **A. vulgaris** var. **Ballii** Litard. & Maire, in Mém. Soc. Sci. Nat. Maroc. xxvi, 3 (1930).

Plant 7–12 dm. high, glandular-pilose above: leaves 2–3-ternate; leaflets 4 by 4.5 cm., green and glabrous above, paler and sparsely pubescent beneath: sepals white with greenish tips, sometimes slightly bluish, 1.5–2.5 cm. long, 1.3 cm. wide; laminæ white, 8–10 mm. long, 11–12 mm. wide, truncate; spurs thick, arcuate, bluish, 1.3 cm. long: follicles 2–2.5 cm. long; styles 6–7 mm. long.

Type, Mt. Gourza (Tezah), collected by Ball in 1871; Grand Atlas, 6500–9750 feet, Morocco. Specimens seen: *Hooker* collected May 1871, *Ibrahim* in 1883.

d. **A. vulgaris** var. **collina** Richter-Gürke, Pl. Eur. ii, 421 (1903).

A. vulgaris f. *collina* Rouy & Fouc. Fl. France, i, 125 (1893).

A. collina Jord. Diagn. i, 84 (1864).

Much like var. *præcox*, but flowers deep violet, sepals 22 mm. long, much longer than laminæ plus spurs; laminæ 10–12 mm. long: fruits broadly rounded at base.

"Hab. in collibus lapidosis calcareis Beugesi, prope Thoirette (Jura)." Jura, France and Valais, Switzerland. Specimens seen: Jura, *Reinsch;* Maine, *Kennedy, Williams, Collins & Fernald* collected July 6, 1902; Pennsylvania, *N. L. Britton* June 23, 1893.

e. **A. vulgaris** var. **cyclophylla** Richter-Gürke, Pl. Eur. ii, 423 (1903).

A. vulgaris f. *cyclophylla* Rouy & Fouc. Fl. France, i, 125, 126 (1893).

A. cyclophylla Jeanbernat & Timb.-Lagr. in Bull. Soc. Sci. Phys. Nat. Toulouse, iii, 555 (1875–6).

Upper stems densely glandular-pubescent: leaflets large, at least 2–4 cm. long, with narrow sinuses: spurs shorter than laminæ, saccate: fruit narrowed at base.

Southwestern France and eastern Pyrenees. No specimens seen.

f. **A. vulgaris** var. **dumeticola** Richter-Gürke, Pl. Eur. ii, 423 (1903).

A. vulgaris f. *dumeticola* Rouy & Fouc. Fl. France, i, 125 (1893).

A. dumeticola Jord. Diagn. i, 80 (1864).

Stem glandular-pubescent: leaflets 3–6 cm. long, pubescent beneath: flowers pale violet; sepals about 2.5 cm. long, 12 mm. wide, long-acute;

laminæ about 11 mm. long, rounded; spurs about 15 mm. long: fruits broadly rounded at base.

Type locality, near Bastelica, Corsica. Specimens seen, *E. Reverchon* collected in 1885 and June 10, 1878.

g. **A. vulgaris** var. **eynensis** Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 290 (1893).

Stems 1–few-flowered, 1–4 dm. high, glandular-viscid especially above: leaves biternate, the leaflets rounded-obovate, 1–2.3 cm. long, glabrous above, glandular-pilose beneath: flowers blue; sepals 2.5–3 cm. long, 1–1.5 cm. wide; laminæ 10–12 mm. long, somewhat rounded; spurs about 1.8 cm. long; stamens about as long as laminæ: fruits about 2.3 cm. long.

Native in the Pyrenees. Collections seen: *Bordère* collected July 1876 and June 25, 1882, *Skeyer* July 1839.

h. **A. vulgaris** var. **glabella** Schur, Enum. Pl. Transsilv. 28 (1866).

Stem, leaves, peduncles and carpels glabrous.

"In den Wäldern des Götzenberg bei Heltau." No material seen.

i. **A. vulgaris** var. **glanduloso-pilosa** Schur, l. c.

Stem and peduncles and leaves densely glandular-pilose; otherwise like *A. vulgaris* itself.

"In den Waldungen hinter Gurariu in der Nähe des Zibinfalles." Bosnia, Hercegovina, Montenegro. No specimens seen.

j. **A. vulgaris** var. **hispanica** Willk. in Willk. & Lange, Prodr. Fl. Hisp. iii, 965 (1880).

A. hispanica Borbás, in Magyar Tudom. Akad. xii, no. 6, 10 (1882).

Stems 3–5 dm. high, pilose below, viscid-glandular above: leaflets pubescent above, more densely so beneath, 2–3 cm. long: sepals about 1.5 cm. long, 0.9 cm. wide; laminæ truncate, 1 cm. long; spurs 1–1.2 cm. long.

Native in Spain ("Costa de Sanjián y Oya"). Collections seen: *E. Reverchon* collected 1891, May 1893, June 1904.

k. **A. vulgaris** var. **incisa** Beck, Fl. Südbosn. in Ann. Naturhist. Hofmus. Wien, vi, 341 (1891).

Leaves more or less triternate.

Occurs in Bosnia and Hercegovina. None seen.

l. **A. vulgaris** var. **longisepala** Gürke in Richter-Gürke, Pl. Eur. ii, 422 (1903).

A. vulgaris subsp. *typica* var. *longisepala* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 288 (1893).

A. longisepala Zimmeter, Verw.-Verh. Eur. Aquil. 26 (1875).

Stems 4–7 dm. high, glandular-pubescent above: leaves biternate, glabrous, green, with leaflets to 5 cm. long, trilobed one-third to one-fourth of the way to the base: flowers rich blue; sepals lanceolate, about 3.8 cm. long, 1.2 cm. wide; laminæ rounded-truncate, about 1 cm. long; spurs 2 or more cm. long; stamens about 5 mm. longer than laminæ.

Hungary. No material seen.

m. **A. vulgaris** var. **mollis** Richter-Gürke, Pl. Eur. ii, 422 (1903).

A. vulgaris f. *mollis* Rouy & Fouc. Fl. France, i, 125, 126 (1893).

A. mollis Jeanbernat & Timb.-Lagr. in Bull. Soc. Sci. Phys. Nat. Toulouse, iii, 555 (1875–6).

Plant soft-hairy: leaves large; leaflets with narrow sinuses: pedicels glandular-pubescent; spur elongate: fruit narrow at base.

Southwestern France (Aude) and eastern Pyrenees. None seen.

n. **A. vulgaris** var. **nemoralis** Richter-Gürke, Pl. Eur. ii, 421 (1903). Fig. 13.

A. vulgaris f. *nemoralis* Rouy & Fouc. Fl. France, i, 124, 125 (1893).

A. nemoralis Jord. Diagn. i, 83 (1864).

Peduncles soft-pubescent, eglandular: leaflets 1.5–2.5 cm. long: flowers milky-violet-blue; sepals elliptic-lanceolate, 1.5–1.8 cm. long, 9–10 mm. wide; laminæ 8–10 mm. long; spurs 12–14 mm. long.

"Hab. in nemorosis circa Lyon." Collections seen: France, *Jacquemont*, collected June 1820, *E. Jeanpert* June 17, 1891; Switzerland, *G. F. Atkinson* July 14, 1910.

o. **A. vulgaris** var. **nivea** Reichb. Fl. Germ. Exc. 748 (1832).

A. nivea Baumg. Enum. Stirp. Transsilv. ii, 104 (1816).

A. vulgaris var. *albiflora* Schur, in Verh. Siebenb. Ver. Naturw. iv, 30 (1853).

A. vulgaris var. *ochroleuca* Schur, op. cit. 31.

A. ochroleuca Baumg. ex Schur, l. c.

A. vulgaris var. *glabra* Heuff. Enum. Pl. Ban. 11, in Verh. Zool. Bot. Ges. Wien, viii, 47 (1858).

Flowers white.

Mostly in gardens, seldom wild (Germany, Hungary). Collections seen: Europe, *Anna Pehersdorfer* collected June 3, 1884, *Straehler* in 1876; United States, as an escape, *L. H. Bailey* June 4, 1920, *W. Deane* July 6, 1896, *Anna Murray Vail* June 14, 1891, *E. F. Williams* June 9, 1898, *Kennedy, Williams, Collins & Fernald* July 6, 1902.

p. **A. vulgaris** var. **notabilis** Beck, Fl. Nieder-Oesterr. i, 400 (1890).

Basal leaves once-ternate only; leaflets subcordate, deeply 3-fid, the segments lobed to one-third their length.

Said to come from Lower Austria and Bosnia. Not seen.

q. **A. vulgaris** var. **parviflora** Schur, Enum. Pl. Transsilv. 28 (1866).

A. Ebneri Zimmeter, Verw.-Verh. Eur. Aquil. 21 (1875).

A. vulgaris var. *Ebneri* Beck, Fl. Nieder-Oesterr. i, 400 (1890).

A. nigricans var. *Ebneri* Beck, Fl. Südbosn. in Ann. Naturhist. Hofmus. Wien, ii, 69 (1887).

Leaflets 1–2 cm. long: flowers ruddy-blue; sepals 1.8–2 cm. long; laminæ 8–10 mm. long; spurs about equalling laminæ.

"In den Laubwäldern oberhalb des Dorfes Resinár," Transylvania. Collections seen: Styria, *Kristof* collected May 1878, *Proyer* in 1908; Carniola, *Freyer 1289.*

r. **A. vulgaris** var. ? **platysepala** Mert. in Koch, Deutschl. Fl. iv, 93 (1833); Reichb. Icon. Fl. Germ. iv, 27, t. 114, fig. 4730 (1840).

A. platysepala Reichb. Fl. Germ. Exc. 748 (1832).

Sepals more broadly ovate than in the species, obtuse, mostly about 18–20 mm. long, 12–14 mm. wide.

Doubtfully distinct; said to be rare and with the typical species; probably only a form. Collections seen: Sweden, *F. Ahlberg* collected January 1870; France, *F. Raine* June 14, 1907; Germany, *A. Schott* May 30, 1849; Austria, *Strasser 892;* naturalized in North America, New York, *O. P. Phelps 477, 476, Griscom, Metcalf & Wright 6457, Eames & MacDaniels 514,* Connecticut, *C. H. Bissell* June 3, 1906, Massachusetts, *G. G. Kennedy* June 2, 1902.

s. **A. vulgaris** var. **præcox** Richter-Gürke, Pl. Eur. ii, 421 (1903).

A. vulgaris f. *præcox* Rouy & Fouc. Fl. France, i, 125 (1893).

A. præcox Jord. Diagn. i, 85 (1864).

Upper stems densely short-pubescent, with some hairs gland-tipped: leaves pale green: flowers blue-violet; sepals 2.4–2.7 cm. long, 1.2–1.3 cm. wide, rather abruptly and sharply acute; laminæ 10–12 mm. long; spurs about the same: group of follicles narrowed at base.

"Hab. in nemorosis Gallo-provinciæ superioris: Mont-de-Lure prope Forcalquier (Basses-Alpes)." France: Hautes-Alpes, Basses-Alpes, etc. The following collections represent this variety: *Déséglise* collected June 9, 1876, *E. T. & H. N. Moldenke 9032, E. Reverchon* June 20, 1870, *Tillet* July 1878.

t. **A. vulgaris** var. **ruscinonensis** Richter-Gürke, Pl. Eur. ii, 423 (1903).

A. vulgaris f. *ruscinonensis* Rouy & Fouc. Fl. France, i, 125, 126 (1893).

A. ruscinonensis Jeanbernat & Timb.-Lagr. in Bull. Soc. Sci. Phys. Nat. Toulouse, iii, 554 (1875–6).

Stems glandular-pubescent: leaves large, the leaflets 2.5–4 cm. long, with wide sinuses: sepals 16 mm. long; spurs longer than laminæ: fruit rounded at base.

East Pyrenees. Specimens seen: *Bourgeau* collected June 20, 1850, and 1889.

u. **A. vulgaris** var. **sicula** Strobl, in Oesterr. Bot. Zeit. xxxiv, 369 (1884).

Stems glandular-pubescent above, about 3 dm. high, with several compound leaves, 1-flowered: leaflets 2–3 cm. long: sepals 15–20 mm. long, blue; laminæ rounded, about 1 cm. long; spurs 10–14 mm. long.

Sicily. Specimen seen, *Fr. Carara* collected June 9, 1905.

v. **A. vulgaris** var. **stellata** Schur, Enum. Pl. Transsilv. 28 (1866).

Flowers blue, red, and white; spurs lacking; staminodia larger, two-thirds as long as stamens.

"Bei Kronstadt." Specimen seen: *Hort. Genev.*

w. **A. vulgaris** var. **subalpina** Zimmeter, Verw.-Verh. Eur. Aquil. 17 (1875). Fig. 13.

A. subalpina Boreau, Fl. Centr. France, Ed. 3, ii, 24 (1857).

A. vulgaris f. *subalpina*, Rouy & Fouc. Fl. France, i, 124, 125 (1893).

A. vulgaris var. *grandiflora* Schur, in Verh. Nat. Ver. Brünn, xv, pt. 2, 61 (1876).

Pedicels somewhat glandular-pilose; sepals ovate-lanceolate, subacuminate, 3–3.5 cm. long. This is toward *A nigricans* in glandular condition and large flowers, but leaflets are broader, less incised, stems less pubescent.

The following collections represent the variety: Monaco, *Zuccarini;* Styria, *K. Richter* collected July 2, 1886; Bosnia, E. *Brandis 2505.*

x. **A. vulgaris** var. **subtomentosa** Čelak. in Sitzungsber. Böhm. Ges. Wiss. Prag. 31 (1893).

Stems and petioles densely hairy: leaves densely gray soft-hairy beneath, almost tomentose: peduncles hairy and glandular-pubescent.

Type locality, "So im Wäldchen des Klosters Hájek bei Unhošt! Bei Leitomyšl hinter Lauterbach gegen Sebranice," Czechoslovakia. Not seen.

For the following varieties not enough information has been available to place them in the key:

(1) **A. vulgaris** var. **Huteri** Fiori, Nuova Fl. Anal. d'Ital. i, 683 (1925).

A. Bertolonii var. *parviflora* Huter, Porto & Rigo, Exs. Itin. Ital. iii, no. 513 (1877).

A. Huteri Borbás, in Magyar Tudom. Akad. xii, no. 6, 9 (1882), nomen.

Stems 2–6 dm. high, 1–few-flowered: leaves viscid: sepals 2.5 cm. long, violet to blue; stamens little exceeding laminæ.

Calabria, Italy.

(2) **A. vulgaris** var. **pseudoatrata** Erdner, Fl. von Neuburg, 212 (1911); Hegi, Ill. Fl. Mit.-Eur. iii, 481 (1909).

Stems subglabrous: flowers dark violet; sepals mostly over 2.5 cm. long; stamens equal to or scarcely exceeding laminæ.

About Neuburg, Bavaria. Resembling *A. atrata* in color but with short stamens. I am not certain of original place of publication.

(3) **A. vulgaris** var. **riffiensis** Pau, in Broteria Cienc. Nat. (Lisboa), v (3), 114 (1936).

Stems strongly glandular-pubescent: leaves glabrous and green above, grayish and subglabrous beneath (sparsely short-pilose when young): flowers large, blue, with hooked spurs; stamens ovate-lanceolate.

Cultivated from seeds collected by Sennen at Tidigúin, in Spanish Morocco.

(4) **A. vulgaris** var. **sylvestris** Schur, Enum. Pl. Transsilv. 28 (1866).

A. sylvestris Schur, in Verh. Siebenb. Ver. Naturw. iv, 4 (1853).

Stems slender, puberulent below, glandular-pilose and purplish above, 3–4 dm. high, few-flowered: leaves small, bicolored, glaucous beneath: sepals dilated, elliptic, acuminate; petals very obtuse, shorter than stamens.

On the Transylvanian Alps, at foot of Fromoasze, at 5000 feet elevation.

Horticultural forms of *A. vulgaris:*

Aquilegia vulgaris has probably been in cultivation in Europe as long as any columbine, and, variable as it is in nature, it has produced many forms for the gardener. That some of these are old is evidenced by the illustration of double and spurless forms in the year 1591 (Lobelius, Icones Stirpium, 762–4). Some of the more important named forms are:

(1) White-flowered

Var. **nivea** Reichb. Flowers white. Known mostly as a garden plant,

sometimes wild (Germany, Hungary) and as an escape in America. Various horticultural names have been used for a strain with rather large pendent flowers: var. *alba* Hort., var. *grandiflora* Hort., var. *nivea grandiflora* Hort., *A. nivea grandiflora* Hort., Munstead White. There is also a var. *alba nana compacta* Hort. (var. *compacta* Hort.). *A. vulgaris* "Edelweiss" (*A. vulgaris* var. *compacta* "Edelweiss," var. *erecta* "Edelweiss") is a fairly recent introduction with erect white flowers (Gartenwelt, xxxiv, 280, 1930).

(2) Double-flowered

Var. *plena* Hort. or var. *flore-pleno* Hort. (*A. plena* Hort. ex Steud. Nom. Ed. 2, i, 115, 1840) are general names for much doubled flowers of various colors. Various botanical names have been proposed indicating the types of doubleness: monstr. *plena* Reichb. Fl. Germ. Exc. 748, 1832, flowers double, with many petals; monstr. *multifaria* Reichb. l. c., flowers double with many sepals; monstr. *inversa* Koch, Syn. Ed. 2, 23, 1843 (f. *inversa* DC. Prodr. i, 50, 1824, *A. inversa*, Mill. Gard. Dict. Ed. 8, no. 3, 1768), spurs curved upward; monstr. *corniculata* Koch. l. c. (f. *corniculata* DC. l. c.), spurs curved outward. Var. *alba flore-pleno* Hort. is of course double white. Var. *caryophylloides* Moore, in Proc. Hort. Soc. i, 229 (compare Floral Mag. i, t. 17, 1861) (*A. caryophylloides* Hort.), semi-double, with 15–20 petals in 3–4 whorls, white, striped or flushed with red, spurs normal.

(3) Spurless forms

Var. *stellata* Schur (*A. stellata* Hort. ex Steud. Nom. 61, 1821, *A. vulgaris* f. *stellata* DC. Prodr. i, 50, 1824, *A. ecalcarata* Hort. ex Steud. Nom. Ed. 2, i, 115 1840, nomen). Perianth-segments 10 or possibly more, variously colored (Gartenfl. xxv, 153, 1876). An article by Pépin (Rev. Hort. ser. 2, iv, 165, 1845) showed semi-double spurless blue and semi-double spurless red flowers and proposed a var. *anemonoides* Pelé. Near to *stellata* and with large flowers is apparently *A. clematiquila* Hort. It was described in Gartenwelt, xxxv, 386, 1931, as a lilac to deep violet novelty. The Journal of the Royal Horticultural Society, xl, 275, 1914, in covering the Wisley Aquilegia trial for that year discusses *A. clemataquila* (note spelling), stems green to reddish, 9–12 dm. high; flowers without spurs, more or less double, in varying shades of violet-blue and purple. The flower size is not given but, judging from pictures, it must be 7–8 cm. across and flowers are nodding. The 1914 reference is the earliest I have found. When one reads for this variety in a fairly recent catalogue "large white, with extra long spurs" and in another "petals narrow, spurless," it is obvious that not all material classed as *clematiquila* is the same.

(4) Color forms

Various color forms, some of which are in the trade, are: var. *atrocærulea*

Hort., var. *atrocarminea* Hort., var. *atropurpurea* Hort., var. *atrorosea* Hort., var. *atrosanguinea* Hort., var. *atroviolacea* Hort., var. *cærulea* Hort., var. *lilacina* Hort., var. *rosea* Hort. Very likely some of the darker colored forms belong to *A. atrata* or *A. nigricans* rather than *A. vulgaris*.

(5) Miscellaneous

A. baicalensis Hort. S. Arnott (Gard. Chron. ser. 3, xxvii, 407, 1900) described it as dwarf, blue, white and green, about 3 dm. high. At the Wisley trials of 1914 and 1927 (Journ. Roy. Hort. Soc. xl, 273, 1914, and liii, 164, 1928) the flowers are given as short-spurred. Boothman (Gard. Chron. ser. 3, xcv, 13, 1934) said all plants he had seen were to be referred to *A. vulgaris*. It would seem, then, that the name is being misapplied by some American firms when described as long-spurred.

A. vulgaris var. *Vervæneana* Hort. (*A. Vervæneana*, Hort.) is a form with variegated or mottled leaves. (Wien. Ill. Gart.-Zeit. x, 86, 1885.)

One of the botanical varieties is listed in the trade, namely var. *hispanica* Willk. (*A. hispanica* Borbás, probably *A. lapponica* Hort.). Such material as I have seen is nearer the var. *mollis*.

A. vulgaris var. *hybrida* Baker, in Gard. Chron. ser. 2, x, 76 (1878) (*A. hybrida* Sims, in Bot. Mag. t. 1221, 1809). As originally described, it has leaves pubescent; sepals lilac-purple, about 2 cm. long; laminæ white, truncate, about 1 cm. long; spurs somewhat incurved, about 2 cm. long, blue; stamens slightly exserted. A garden form appearing in England in 1809 among seedlings of *A. canadensis* and supposed at that time to be a hybrid with *A. vulgaris*. Actual hybrids of these two species are very much like this supposed one. The name *A. hybrida* Hort. is in the trade, but now used largely in quite a different sense, namely for long-spurred strains like Mrs. Scott Elliott and Rainbow, which undoubtedly have genes of *A. chrysantha*, *A. cærulea*, etc. The name *A. hybrida* var. *lucida* Hort. (*A. lucida* Hort.) is applied to a double scarlet-brown columbine, and var. *vernalis* Hort. to a partly double, long-spurred, early-flowering strain.

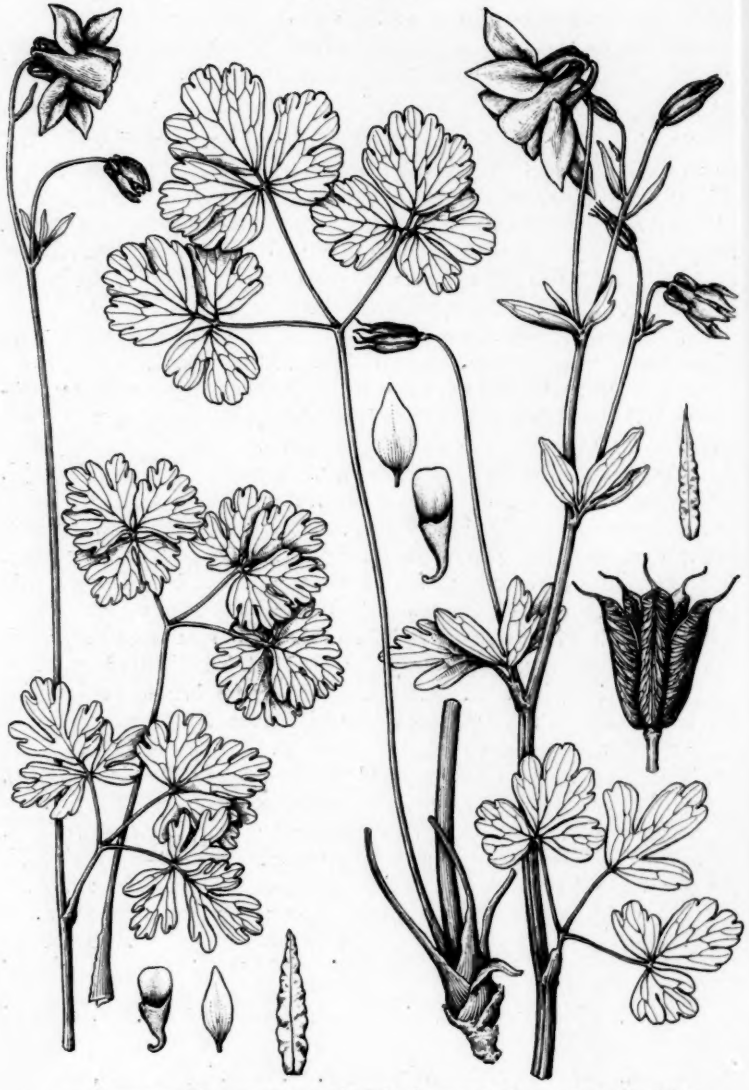
A. Braunii Hort., as offered in the American trade, is very close to *A. vulgaris* var. *collina* Richter-Gürke. Whether this has anything to do with the botanical name *A. Braunii* Borbás (Magyar Tudom. Akad. xii, no. 6, 10, 1882, which in this reference was a nomen nudum) I do not know.

17. **Aquilegia olympica** Boiss. in Ann. Sci. Nat. ser. 2, xvi, 360 (1841). Fig. 14.

A. vulgaris var. *olympica* Baker, in Gard. Chron. ser. 2, x, 76 (1878).

A. vulgaris var. *caucasica* Ledeb. Fl. Ross. i, 56 (1842).

A. caucasica Ledeb. ex Rupr. Fl. Cauc. 32 (1869).



14. Aquilegia Kareliniana to the left. Aquilegia olympica to the right.

A. Wittmanniana Stev. ex Finch & Meyer & Avé-Lall. in Ind. Sem. Hort. Petrop. xi, suppl. 15 (1846).

Possibly *A. blanda* Lem. in Ill. Hort. t. 146 (1857).

Stems 3–6 (8) dm. high, 3–4 mm. thick at base, subglabrous below, densely glandular-pilose above, several-flowered and -branched: basal leaves biternate, petioles commonly 10–15 cm. long, scattered-pilose at least in upper part; primary petiolules 3–5.5 cm. long, glandular-pilose, secondary up to 2 cm. long; leaflets thin, cuneate-ovate to -obovate, 2.5–4 cm. long, about as wide or wider, glabrous and light green above, scattered-pilose and paler beneath, 2–3-fid half or two-thirds to base, then with several oblong lobes or teeth 3–6 mm. wide; cauline leaves about 3, passing into lanceolate 1–3-lobed bracts 1–2 or more cm. long: flowers nodding, on pedicels 3–12 cm. long; sepals spreading, light claret to lilac-purple, oblong-ovate, subacuminate, 2–4.5 cm. long, 1.3–2 cm. wide, somewhat puberulent toward apex; laminæ colored to whitish, somewhat truncate, sometimes retuse, oblong, 1.4–2 cm. long; spurs strongly hooked, 15–20 mm. long, 5–9 mm. wide near base; stamens about equal to laminæ, anthers dark, about 1 mm. long; staminodia 11–12 mm. long, acutish: follicles 5–8, densely glandular-pilose, 2–3 cm. long, erect or somewhat divergent, the styles almost glabrous, 4–5 mm. long; seeds black, minutely punctate, about 2 mm. long.

Type locality "Olympus Armenus." Range, Caucasus from southern Russia to northern Turkey and Iran. Collections seen are: Turkey, *B. Balansa 1351*, *P. Sintenis 7113*, *1122;* Russia, *Alexeenko & Woronow* collected May 19, 1902.

Adequate material is lacking to determine whether the bicolored form should be maintained as a var. *caucasica*, but Komarov (Fl. U. R. S. S. vii, 94, 1937) reduces it outright. Although close to *A. vulgaris*, *A. olympica* seems worth specific rank with its broad sepals, long laminæ, acuminate staminodia, and isolated range.

The name *olympica*, or *vulgaris* var. *olympica*, is fairly common in horticultural literature, the garden plant being for the most part that form with whitish laminæ. Some plants sold as *A. vulgaris* var. *nivea* belong here. The name *A. caucasica* is sometimes used by nurserymen. Nicholson (Dict. Gard. suppl. 79, 1900) describes *A. olympica* var. *flore-pleno* Hort. with a double white center, introduced 1888.

18. **Aquilegia Kareliniana** C. A. Mey. ex Trautv. in Act. Hort. Petrop. viii, 53 (1883). Fig. 14.

A. vulgaris var. *Karelinii* Baker, in Gard. Chron. ser. 2, x, 76 (1878).

A. Karelinii O. & B. Fedtsch. Ranunc. Typkectaha, 65 (1899).

A. Sternbergii Kar. & Kir. in Bull. Soc. Nat. Mosc. xv, 135 (1842), not Reichb. 1832.

Stems 2–8 dm. high, glandular-pilose throughout, 2–3 mm. thick, few-flowered, usually 1–3-leaved: basal leaves few to several, biternate, the petioles up to 2 dm. long, scattered-pilose; primary petiolules 2–5 cm. long, glandular-pilose, secondary 0–1 cm. long; leaflets thin, light green and glabrous above, paler, apparently glaucous, and slightly puberulent beneath, 1–3.5 cm. long, as wide or wider, more or less cuneate-obovate, 2–3-fid to near the middle, then few-lobed with blunt oblong teeth 2–4 mm. wide; cauline leaves gradually reduced, the upper bracts with 1–3 lanceolate segments 1–2 cm. long: flowers few, nodding, on pedicels 5–15 cm. long; sepals spreading-reflexed, bright lilac or claret-purple, lance-ovate, 18–24 mm. long, 6–10 mm. wide, acute, puberulent; laminæ of same color, truncate, 9–11 mm. long; spurs of same color, strongly hooked, about 1 cm. long, 3–4 mm. wide near base; stamens about equal to laminæ, the anthers yellow, 1.5 mm. long; staminodia about 8 mm. long, somewhat crinkled, not sharp-pointed: follicles 5, densely glandular-pilose, 2.5 cm. long; styles somewhat pubescent, about 6–7 mm. long; seeds not seen.

Type locality, Alatau. Range apparently western Siberia, southward at least to Turkestan. Specimens seen, all from Siberia: *Karelin & Kiriloff 1163*, *Laposhninow* collected in 1913, *Mokeeva & Popov* July 12, 1924.

The short spurs, more pointed staminodia, and distinct range argue for recognition as a species, not as a variety under *A. vulgaris*.

This species is not available for cultivation, except as offered by a few botanical gardens.

19. **Aquilegia oxysepala** Trautv. & Mey. Fl. Ochot. 10 (1856). Fig. 15.

A. vulgaris var. *oxysepala* Regel, Tent. Fl. Ussur. 9 (1861).

A. vulgaris subsp. *oxysepala* var. *mandshurica* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 285 (1893).

A. vulgaris var. *oxypetala* Franch. Pl. David. i, 21 (1884), sphalm.

Stems mostly 5–10 dm. high, 3–5 mm. thick near the base, subglabrous to scattered-pilose, more or less open-branched above, rather densely glandular-pubescent on the pedicels: basal leaves several, biternate, the petioles mostly 15–25 cm. long, much dilated toward base, subglabrous or scattered-pilose; primary petiolules tending to be more densely pilose, 1.5–7 cm. long, dark, secondary petiolules up to about 1 (2.5) cm. long, dark, pilose; leaflets thickish in texture, green and glabrous above, paler somewhat glaucous beneath and sometimes puberulent near the base, cuneate-obovate or broader in outline, mostly 3–6 (8) cm. long, nearly as wide to more so, 2–3-fid to near the middle, then each part with 2–3 or more broad rounded-oblong lobes 3–10 mm. wide; cauline leaves several, gradually reduced upward, the uppermost becoming sessile 1–3-lobed bracts 0.5–5 cm. long and up to 2 cm. wide: pedicels up to 15 or more cm. long, somewhat arched, the flowers horizontal to nodding; sepals divergent, ovate-lanceolate, acuminate, 2–3 cm. long, 8–12 mm. wide, somewhat puberulent, claret-red to violet, laminæ oblong, rounded-truncate, yellowish-white, 10–13 mm. long, 7–9 mm. wide; spurs dark, strongly hooked, 1.5–2 cm. long, 4–5 mm. wide near base; stamens about equalling laminæ,

15. AQUILEGIA OXYSEPALA with detail of floral parts to right. At lower left flower and follicles of var. KANSUENSIS.

anthers dark, almost 2 mm. long; staminodia sharply acute, 6–9 mm. long, scarcely crisped on margins: follicles 5, glandular-pubescent, 2.5–3 cm. long, slightly divergent at apex, the styles an additional 6–7 mm. long, glabrous except at base; seeds black, shining, almost 2 mm. long.

Type locality, Udskoi, eastern Siberia. Range, eastern Siberia and Manchuria. Representative material seen: Siberia, *F. Karo 400, V. Komarov 668, D. L. Topping 2175, T. D. A. Cockerell* collected July 1923; Manchuria, *P. H. Dorsett 3526, 6304, P. H. & J. H. Dorsett 5990, H. W. Kung 1894, W. H. Cowgill 1894, D. Litvinov 2951, 2629.*

The more sharply pointed staminodia and sepals set *A. oxysepala* apart from *A. vulgaris.*

Key to varieties of *A. oxysepala:*

Sepals mostly 2.5–3 cm. long: follicles mostly 2.5–3 cm. long. Siberia and Manchuria..... *A. oxysepala*

Sepals 1.6–2.5 cm. long: follicles 1.2–1.7 cm. long.

Sepals and petals of same color. Jehol to Shansi..... a. var. *Yabeana*

Sepals purplish; petals yellowish. Hupeh to Yunnan..... b. var. *kansuensis*

†a. **A. oxysepala** var. **Yabeana** stat. nov.

A. Yabeana Kitagawa, in Rept. 1st Sci. Exped. Manch. sect. 4, pt. 4, 81, t. 1 (1936).

Essentially like *A. oxysepala* in stature, pubescence and morphology, but leaflets of basal leaves slightly smaller, mostly 2–4.5 (6) cm. long: sepals purplish, 16–26 mm. long; laminæ about 12 mm. long, purplish; spurs about same as in the species; staminodia acute, 5–6 mm. long, usually crisped on margin: follicles 12–17 mm. long.

Type locality, Mt. Hsiao-wu-t'ai-shan, Hopei, China. Ranging from Jehol and Shantung to Hopei and Shansi. Representative collections are: Jehol, *R. Armacost 106:* Korea, *K. S. Gilbert 57;* Hopei, *J. C. Liu L 675, 1730, L2551, F. T. Wang 20100, C. F. Li 10684:* Shansi, *T. Tang 809, R. W. Chaney 1034, E. Licent 12190, K. Ling 1680, W. C. Lowdermilk 5590;* Shantung, *C. Y. Chiao 2678.*

b. **A. oxysepala** var. **kansuensis** Brühl ex Handel-Mazetti, Symb. Sin. vii, 271 (1931). Fig. 15.

A. vulgaris subsp. *oxysepala* var. *kansuensis* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 285 (1893).

Very close to var. *Yabeana* but leaflets mostly 1–2.5 cm. long, sometimes 4.5 cm., less firm in texture: sepals purplish; laminæ yellowish.

Type locality not stated, apparently Kansu. Ranging into southeastern China, Hupeh and Kansu to northwestern Yunnan. Representative collections of var. *kansuensis* are: Hupeh, *A. Henry 6427, 6427A, E. H. Wilson 1085, 1331;* Szechwan, *W. P. Fang 4116, H. Stevens 256, 453;* Yunnan, *J. F. Rock 10077, 17013.*

The following specimens have the spurs of var. *kansuensis*, but the staminodia of *A. Rockii:* Yunnan, *Handel-Mazetti 9862, E. E. Maire 7442, J. F. Rock 12887.*

Aquilegia oxysepala is in cultivation, being listed by many dealers. I have seen garden specimens called *A. virescens* Hort., *A. sibirica* and *A. Buergeriana* that were to be referred to *A. oxysepala* var. *Yabeana.*

20. **Aquilegia viscosa** Gouan, Fl. Monsp. 267 (1765); Ill. et Obs. Bot. 32, t. 19 (1773). Fig. 9.

A. vulgaris var. *viscosa* Gren. & Godr. Fl. France, i, 44 (1848).

A. vulgaris subsp. *viscosa* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 296 (1893).

A. Magnolii Loret, in Loret & Barrandon, Fl. Montp. ii, 796 (1877).

A. vulgaris var. *hirsutissima* Lapeyr. Hist. ab Pyrénées, 306 (1813).

A. hirsutissima Timb.-Lagr. in Bull. Soc. Bot. France, xix, 94 (1872), nomen; Timb. op. cit. xxix, Rev. Bibl. 47 (1882).

A. Kitaibelii Auth. not Schott, 1853.

A. Kitaibelii var. *minor* Rouy & Fouc. Fl. France, i, 128 (1893).

Stems 1.5–3.5 dm. high, 1–2 mm. thick, sparsely short-pilose below, glandular-pilose above, 1–few-flowered: basal leaves rather few, mostly biternate; petioles 3–12 cm. long, slender, glandular-pilose; petiolules up to 4 cm. long, glandular-pilose; leaflets nearly or quite sessile, sometimes not completely separated, cuneate-obovate, mostly 1–2.5 cm. long, greenish and pubescent above, glaucous and glandular-pilose beneath, 2–3-fid to near the middle, the rather divergent divisions then usually with 2 or 3 oblong roundish coarse teeth; lower cauline leaf usually petioled, the upper sessile and reduced to 1–3-lobed lance-linear bracts 5–20 mm. long: pedicels slender, to about 8 cm. long; flowers nodding, lilac-blue; sepals spreading, lance-ovate, 22–27 mm. long, 9–10 mm. wide, subacuminate, somewhat pubescent on backs especially toward apex; laminæ oblong, about 12 mm. long, 10 mm. wide, rounded-truncate; spurs hooked, 15–20 mm. long, pubescent, about 5 mm. wide near base; stamens about as long as or 1–2 mm. shorter than laminæ, anthers yellow, 1.5 mm. long; staminodia acute, 7–8 mm. long, somewhat crinkled: follicles glandular-pubescent, about 12 mm. long, the styles an additional 6–7 mm. long.

Type locality, "Habitat circa Meyrueis, & au Vigan." Found in limestones in southern France: Gard, *Maguier 2634, D. Tuezkiewicz 3804, V. Espagne 3219;* Aveyron, *Tueck* collected June 26, 1905 and June 17, 1903.

I take up the name *viscosa* for the columbine of Gard and Aveyron with misgiving. Meyrueis is a small town near Florac in Lozère, France, and not toward the Pyrenees. The name *viscosa*, then, would seem to be ap-

plicable to plants here treated, rather than to the form of *A. vulgaris* from the Pyrenees to which, as of varietal rank, Rouy & Foucaud (Fl. France, i, 124, 126, 1893) and others have applied it. Gouan's short description might fit either, his plate showing a plant in fruit. Baker (Gard. Chron. ser. 2, x, 19, 1878) agrees with my interpretation. Loret distinguishes his *A. Magnolii* from *A. vulgaris* (with *A. viscosa* in synonymy) on the basis of leaflets incised almost to the base instead of near the middle, but Gouan's figure shows them as divided nearly or quite to the base.

I have seen the name *viscosa* listed by one European botanical garden, and *hirsutissima* by one American nurseryman. In neither case could a check be made on determination.

21. **Aquilegia montisicciana** FontQuer, in Treb. Mus. Ciènc. Nat. Barcelona, v, ser. bot. no. 3, 200 (1920).

Stems 15–35 cm. high, simple or branched, viscid-pubescent, dark: basal leaves ternate, the leaflets deeply tripartite, the segments unequally round-lobed, pale green above, apparently glandular-pilose on both surfaces but particularly on margins and petioles; cauline leaf usually 1; upper bracts with 1 or 3 linear lobes: flowers pale blue to white; sepals ovate- or lance-oblong, subacuminate, 20–24 mm. long, 6.5–9.5 mm. wide; laminæ rounded to subtruncate, 7–12.5 mm. long, 6.5–8 mm. wide; spurs hooked, 10–19 mm. long; stamens equalling the laminæ, anthers yellow; staminodia acute: follicles 3–5, glandular-pubescent, 14–19 mm. long, the styles an additional 8 mm. long.

Type locality, "in glareosis calcareis Montsech d'Ares (Lleida)" at 3900 feet altitude, Catalona, Spain. I have seen no specimens.

As described, this species is near to *A. Kitaibelii* but with leaves simply ternate, less viscid, and with larger fruits. It is near to *A. aragonensis* but with spurs hooked, leaflets tripartite (not trisect), flowers larger, spur longer in relation to lamina.

This species is not in cultivation.

22. **Aquilegia Amaliæ** Heldr. in Boiss. Diagn. ser. 2, i, 11 (1853). Fig. 16.

A. Ottonis var. *Amaliæ* Rapaics, in Bot. Közlem. viii, 133 (1909).

A. vulgaris subsp. *Ottonis* var. *Amaliæ* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 313 (1893).

Stems 2–3 dm. high, glandular-pilose, about 1.5 mm. thick below, 1–3-flowered: basal leaves well developed, biternate, the petioles slender, glandular-pubescent, 5–12 cm. long, the primary petiolules 2–5 cm. long, glandular-pubescent, secondary 1–8 mm. long; leaflets cuneate-obovate, membranous, green and glabrous above, glaucous and somewhat pilose beneath (especially toward the base), 1–3 cm. long, 2–3-fid to about the middle, each segment usually with 2–3 broad oblong rounded lobules; petioled cauline leaves none or 1, somewhat reduced, uppermost sessile with 1–3 lanceolate entire or tridentate lobes: flowers nodding, bicolored;

16. AQUILEGIA AMALIÆ to the left and AQUILEGIA OTTONIS to the right.

sepals spreading, pale blue-violet, oblong-ovate, acute, about 18 mm. long, 8–9 mm. wide, somewhat pubescent toward apex; laminæ white, oblong, glabrous, rounded at apex, 13–14 mm. long, 8 mm. wide; spurs curved, almost uncinate, pale violet, 13–14 mm. long, 3–4 mm. wide at base, subglabrous; stamens about equal to laminæ, anthers yellow, about 1 mm. long; staminodia crinkled, sharply acute, perhaps 5 mm. long: follicles 5, about 12 mm. long, erect, glandular-pubescent, the styles an additional 7 mm. long.

Type locality, "in rupibus excelsis, summæ regionis Olympi Thessali." Found in Serbia, Thessaly and Greece according to Hayek (Prodr. Fl. Penins. Balcanicæ, i, 303, 1927); Baker (Gard. Chron. ser. 2, x, 76, 1878) says at 5000–8500 feet. Collections seen: Thessaly, *Heldreich 2400*, Macedonia, *Sintenis & Bornmüller 1147*.

A. Amaliæ var. **dinarica** Hayek, in Prodr. Fl. Penins. Balcanicæ, i, 303 (1927).

A. dinarica Beck, in Ann. Naturhist. Hofmus. Wien. vi, 341, t. 9, fig. 1–5 (1891).

A. vulgaris subsp. *typica* var. *dinarica* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 289 (1893).

Leaflets said to be smaller than in the species: sepals 2.5–3 cm. long: follicles 1.5 cm. long.

Hayek gives Bosnia to Albania as its distribution.

A. Amaliæ var. **taygetea** Hayek, l. c.

A. taygetea Orph. in Atti Congr. Firenze, 214 (1876).

Styles at anthesis much longer than stamens; spurs strongly uncinate. Greece.

Neither the species nor either variety is in cultivation.

23. **Aquilegia Ottonis** Orph. in Boiss. Diagn. ser. 2, i, 11 (1853). Fig. 16.

A. Othonis in Boiss. Fl. Orient. i, 71 (1867).

A. vulgaris subsp. *Ottonis* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 312 (1893).

A. vulgaris subsp. *Ottonis* var. *typica* Brühl, op. cit. 313.

Stems 3–5 dm. high, 1–3 mm. thick, more or less pilose below, increasingly glandular upward, 1–several-flowered: basal leaves biternate, the petioles up to 15 cm. long, somewhat glandular-pilose, the primary petiolules 1–3 cm. long, glandular-pilose, secondary 1–5 mm. long; leaflets membranous, broadly cuneate-obovate, green and subglabrous above, glaucous and pilose beneath, 1–2 cm. long, 2–3-fid to near middle, then with 2–5 rather narrow oblong obtuse lobes; petioled cauline leaves commonly 3–4, gradually reduced up the stem, two or three uppermost sessile, with 1–3 linear to elliptic lobes 5–15 mm. long: flowers bicolored; sepals

blue, broadly oblong, subobtuse at the greenish apex, one-fourth longer than laminæ; laminæ white, truncate; spurs blue, equalling laminæ, uncinate-curved at apex; stamens surpassing laminæ; staminodia plane, sharp-pointed: follicles glandular-pilose, 10–12 mm. long, erect, the pubescent styles an additional 7–8 mm. long.

Type locality, Mt. Chelmos, Peloponnesus. Native in Greece. Specimen seen, *T. G. Orphanides 448*.

The species is very close to *A. Amaliæ*, differing in more truncate longer laminæ, longer spurs, more exserted stamens and apparently longer staminodia.

A. Ottonis var. **unguisepala** Borbás, in Bot. Centralbl. ix, 37 (1882).

A. magellensis Huter, Porta & Rigo, Exs. Itin. Ital. iii, no. 513 (1877).

A. Ottonis var. *magellensis*, Rapaics, in Bot. Közlem. viii, 133 (1909).

A. pyrenaica var. *Ottonis* Fiori, Nuova Fl. Anal. d'Ital. i, 683 (1924).

Basal petioles more densely glandular-pubescent; leaflets 1–3 cm. long: sepals 22–25 mm. long, about 10 mm. wide, lance-ovate; laminæ about 15 mm. long, 8 mm. wide; spurs 18–20 mm. long, slightly pubescent, about 5 mm. wide near base.

Known from Mt. Majella, Aprutium, Italy. I have seen the following collections: *M. Guadagno 1482, Doerfler 569, Huter, Porta & Rigo 513.*

Aquilegia Ottonis has recently been offered by an American firm and their plants seem to agree with the Grecian species.

24. **Aquilegia colchica** Kemularia-Natadze, in Trav. Inst. Bot. Tiflis, i, 113 (1934).

Stems from a thick elongate caudex, tall, divergently branched, densely leafy, glandular-hairy below: leaves numerous, biternate, on elongate petioles, densely grayish soft-pubescent, especially on under surface; leaflets rounded, cuneate-obovate, irregularly coarsely lobed, sessile or terminal one short-petioluled: flowers on long glandular-viscid pedicels, 3–15 in number, 3–5 cm. wide; sepals dark blue, lanceolate or lance-ovate with greenish apex, one and a half times to twice length of the almost truncate white laminæ; spurs long, with thickened greenish tip, strongly hooked or almost spirally coiled; styles equalling stamens: follicles 5, recurved to one side of pedicel, in early age densely pubescent, later subglabrous.

Limestone crags in woods. Caucasus, western Transcaucasian endemic. Described from western Georgia from canyon near Kvareli. No material has been seen; the name apparently is not in the trade.

25. **Aquilegia dichroa** Freyn, in Flora, lxiii, 26 (1880).

Stems 2–7.5 dm. high, erect, 1–2-many-flowered, pilose and sometimes glandular below, glandular-pubescent above: leaves biternate, the petioles 4–18 cm. long; leaflets glabrous and green above, glaucous and pubescent beneath, cuneate-obovate or subrhomboid, 2–3-fid, the divisions then tri-

lobed with lobes entire to 2–3-crenate or -dentate; cauline leaves present, lower like reduced basal leaves, upper with 1–3 entire lanceolate lobes: flowers nodding; sepals ovate-lanceolate, acuminate, blue with greenish tips, pubescent without, 1.5–2 cm. long, 6 mm. wide; laminæ blue to middle or beyond, white at apex, somewhat rounded, about 8 mm. long and wide; spurs hooked, 1.2 cm. long; stamens exceeding laminæ; staminodia obtusish, with crinkled margins, 7 mm. long: follicles 4–6, glandular-pubescent, 2–3 cm. long, the basally pubescent styles about 6 mm. longer.

Type locality, Portugal. Said to occur in northern Portugal. I have seen a meager specimen from Coimbra, *A. Moller 199*.

In the European species with hooked spurs and bicolored flowers, *A. dichroa* and *A. Pancicii* stand apart because of their small flowers. *A. dichroa* of Portugal has biternate leaves and blunt staminodia; *A. Pancicii* of Serbia has triternate leaves and acute staminodia.

A. dichroa var. **Molleriana** Borbás & Freyn ex Mariz, in Bol. Soc. Brot. iv, 108 (1886).

Lower in habit than the species, viscid at base: leaves more incised.

Serra da Estrella (Fonseca), Portugal.

The name *dichroa* appears occasionally in seedsmen's offerings. I have been unable to check any such material.

26. **Aquilegia Pancicii** Degen, in Magyar Bot. Lapok, iv, 118 (1905).

Stems about 5 dm. high, densely glandular-pilose throughout: basal leaves triternate; leaflets densely glandular-pilose on both surfaces, ovate-lanceolate, simple or deeply trifid into oblong lobes, glaucous beneath; cauline leaf 1, ternate: flowers blue, nodding; sepals oblong-lanceolate, short-acuminate, glabrous except for ciliate margin, up to 2 cm. long, 7 mm. wide; laminæ truncate, 7 mm. long and wide, whitish at apex; spurs curved in half circle, about 1.3 cm. long, pilose; stamens surpassing laminæ; staminodia lanceolate, acute: follicles densely glandular-pilose, over 2 cm. long.

Serbia: Suha Planina, collected by C. O. Reiser. Not in cultivation.

27. **Aquilegia amurensis** Komarov, in Not. Syst. Herb. Hort. Bot. U. S. S. R. vi, 8 (1926).

A. flabellata var. *alpina* Kuzen. Bull. Acad. Sci. no. 5, 4 (1915).

Stems 2–5 dm. high, simple or few-branched above, 1–2 mm. thick and glabrous below, more or less glandular-pilose above, nearly or quite leafless except for the floral bracts: basal leaves few, ternate, glaucous, the petioles very slender, subglabrous, 6–15 cm. long, petiolules 1–3 cm. long, more or less pilose; leaflets trisect quite to the base, the segments cuneate-obovate, 3-lobed, the lobes subentire or toothed, broadly rounded-oblong, glabrous above, paler and soft-pubescent beneath; floral bracts linear-lanceolate, 1–3-lobed, 4–7 mm. long: pedicels up to 8 cm. long, flowers suberect; sepals blue-violet, spreading, elliptic-ovate, acute, 1.5–2.5 cm. long,

0.7–1.2 cm. wide, somewhat pubescent; laminæ ochroleucous to white, rounded at summit, oblong, 7–12 mm. long; spurs violet, strongly hooked, 1–1.5 cm. long, 3–4 mm. wide at base; stamens well exserted, anthers yellow, 1 mm. long; staminodia 5–6 mm. long: follicles 4–8, glandular-pilose, divergent, up to 2 cm. long; styles about 5 mm. long, somewhat pilose; seeds not seen.

Type locality, R. Lagar near Radde, Amur, Siberia. Reported also from northern Korea by Komarov from the Amnok River. Specimen seen: *Fomoba* collected June 15, 1927.

The species resembles *A. sibirica* in leafless stems and hooked spurs, but sepals more acute, leaflets and pedicels pilose, flowers less nodding, follicles not glabrous. It resembles *A. flabellata* of Japan in hooked spurs but sepals more acute, follicles not glabrous, flowers less nodding.

The species has been listed by a firm in Japan, otherwise I do not know of its being offered for cultivation.

28. **Aquilegia atrata** Koch, in Flora, xiii, 119 (1830). Fig. 17.

A. vulgaris subsp. *atrata* Gaud. Syn. Fl. Helv. 443 (1836).

A. vulgaris var. *atrata* Gren. Fl. Jurass. 26 (1865).

A. vulgaris var. *atroviolacea* Avé-Lall. De Pl. Quib. Ital. Bor. Germ. Austr. Rar. 15 (1829).

A. atroviolacea Beck, Fl. Nieder-Oesterr. i, 400 (1890).

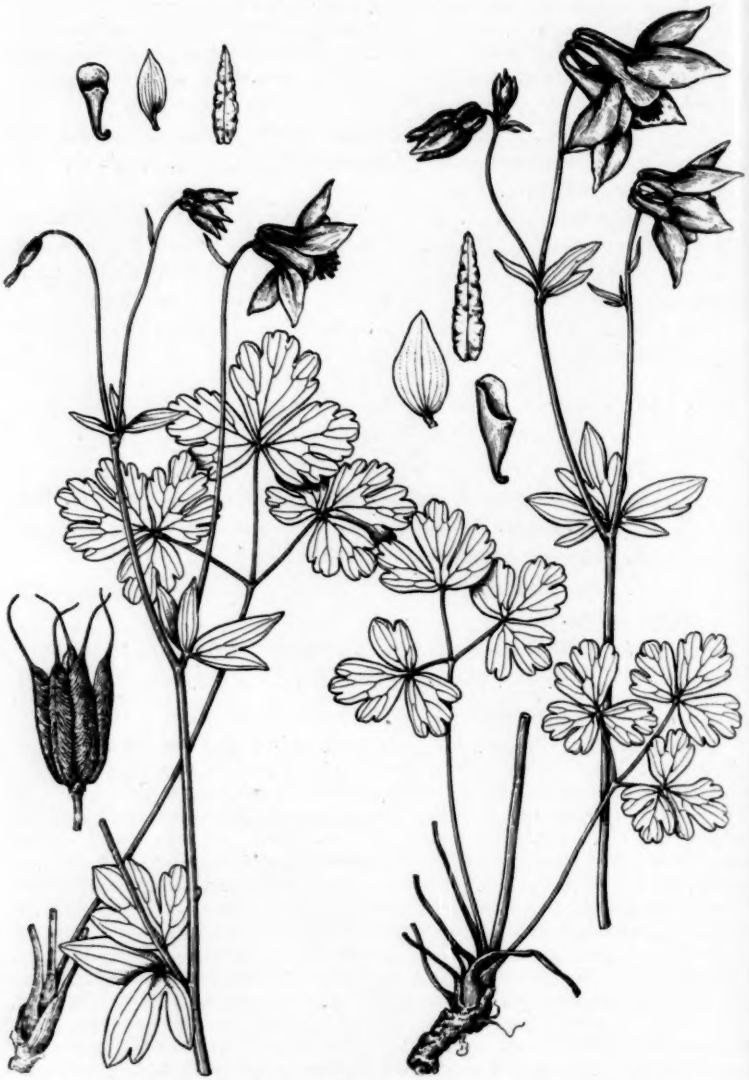
A. vulgaris subsp. *atroviolacea* Rapaics, in Bot. Közlem. viii, 135 (1909).

A. nigricans Reichb. Fl. Germ. Exc. 748 (1832), not Baumg. 1816.

A. vulgaris var. *nigricans* Neilr. Fl. Nieder-Oesterr. 695 (1859).

A. atrata var. *minor* Erdner, Fl. von Neuburg, 212 (1911).

Stems mostly 4–8 dm. tall, 2–4 mm. thick, glabrous to somewhat pilose below, more densely pilose above, few- to many-flowered, with rather open branching: basal leaves membranous, subglabrous, biternate, the petioles up to about 20 cm. long, slender, subglabrous; primary petiolules mostly 2–6 cm. long, subglabrous, the secondary 1–8 mm. long; leaflets broadly cuneate-obovate, practically glabrous, green above, glaucous beneath, mostly 1.5–3 (4) cm. long, as wide or wider, 2–3-cleft to about one-third their length, these divisions then lobed or toothed as deeply as 3 (5) mm. with rounded oblong lobes; petioled cauline leaves usually 1 or 2, reduced; upper bracts sessile, with 1–3 lance-linear to -ovate lobes 1–2.5 cm. long: pedicels up to about 1 dm. long; flowers nodding, mostly dark purple-violet; sepals spreading, lance-ovate, sharply acute to subacuminate, mostly 15–24 mm. long, 8–9 mm. wide, often slightly pubescent on outer surface toward apex and margins; laminæ oblong, somewhat rounded at apex, 8–12 mm. long, 7–9 mm. wide, glabrous; spurs hooked, 10–15 mm. long, about 4 mm. wide near base, pubescent; stamens projecting 5–8 mm. beyond the laminæ, anthers yellow, slightly over 1 mm. long; staminodia



17. Aquilegia atrata to the left. Aquilegia nigricans to the right

plane or somewhat crinkled, 7 mm. long, blunt to rounded at apex: follicles mostly 5, glandular-pubescent, erect, 15–20 mm. long, the subglabrous styles an additional 8–10 mm. long; seeds about 2 mm. long, shining black.

Type locality, Wildbade Kreuth, in Bavarian Front Alps. Apparently mostly on limestone and ranging from southern Bavaria to Styria, Venetia and Grisons. *Aquilegia atrata* seems distinct from *A. vulgaris* in its darker smaller flowers with more exserted stamens. I am taking the plants with glabrous leaves as typical of the species; on the whole the range is more eastern than that of plants with leaves pubescent beneath, although the two overlap in southern Tyrol and Canton Grisons. Representative specimens are: Bavaria, *Molendo* collected in 1888, *Zinsmeister* June 15, 1903; Upper Austria, *Zimmeter 894;* Styria, *B. Fest* June 1906; Carinthia, *F. Kokeil* in 1864; Tyrol, *J. D. Smith* August 1901, *V. Engelhardt* July 28, 1926, *Churchill* June 25, 1913; Venetia, *St. Lager* in 1895, *A. Fiori & A. Béguinot 2277;* Grisons, *von Strom* in 1867, *S. H. Emerson 226, C. Kintschi 536.*

Key to varieties of *A. atrata:*

A. Petals lacking.....e. var. *nigellastrum*
AA. Petals present.
B. Pedicels densely glandular-pubescent; flowers dark blue.....b. var. *cyanescens*
BB. Pedicels less glandular-pubescent.
C. Plant only 2 dm. high, 3–5-flowered: flowers violet-blue. Subalpine.....d. var. *pseud-Einseleana*
CC. Plant taller: flowers usually more numerous.
D. Sepals less than 15 mm. long; spurs bent backward....c. var. *salvatoriana*
DD. Sepals 15–24 mm. long.
E. Leaves glabrous beneath.....*A. atrata*
EE. Leaves pubescent beneath.....a. var. *major*

a. **A. atrata** var. **major** Erdner, Fl. von Neuburg, 212 (1911).

Leaflets pubescent beneath.

Type locality, on the Lech River. Representative collections: Zürich, *W. A. Kellermann* collected June 7, 1887; Bern, *T. W. Edmondson 5678, L. B. & R. C. Smith 2365;* Vaud, *Reuter* in 1853; Valais, *Louis & Emile Gross;* Grisons, *A. S. Pease 9370;* Tessin, *Mary F. Spencer* May 18, 1903; Turin, *E. Rostan 1719, 210;* Vicenza, *J. Ball* June 1872; France, *Fauconnet* July 1852; Tyrol, *Huter* July 13, 1869, *J. Ball* July 1873, July 1877.

† b. **A. atrata** var. **cyanescens** stat. nov.

A. vulgaris var. *cyanescens* Borbás ex Hegi, Ill. Fl. Mit.-Eur. iii, 482 (1909).

A. atroviolacea var. *cyanescens* DallaTorre & Sarnthein, Fl. Tirol, vi, 2, 234 (1909).

Pedicels said to be densely glandular-pubescent; flowers dark blue.

Tyrol and Vorarlberg. Specimens seen: North Tyrol, *J. Woynar* collected June 1876 and June 3, 1887.

I am not at all sure of the original place of publication, nor as to whether it has previously been made a variety of *A. atrata*.

† c. **A. atrata** var. **salvatoriana** stat. nov.

A. vulgaris var. *salvatoriana* Chenev. in Ber. Schweiz. Bot. Ges. xiii, 221 (1905).

A. vulgaris subsp. *atrata* var. *salvatoriana* Schinz u. Thellung in Schinz & Keller, Fl. Schweiz. iii, Aufl. 2, Krit. Fl. 111 (1914).

Stems slender: sepals less than 1.5 cm. long; spurs bent backward.

Mt. San Salvatore, canton Tessin in Switzerland and possibly in adjacent Italy. I have seen one collection: *L. Stejneger* June 25, 1904.

J. Murr (Veröffentl. Mus. Ferdinandeum in Innsbruck, xi, 54, 1931) has described two varieties: var. *pseud-Einseleana*, 2 dm. high, 3–5-flowered, flowers violet-blue, subalpine, Ft. Finstermünz; and var. *nigellastrum*, without petals. I am indebted to Mr. J. C. Bay of the John Crerar Library for the reference covering these varieties.

Borbás (in Engler, Bot. Jahrb. v, 347, 1884) described *A. atroviolacea* var. *dichroantha*, a bicolored plant from Carinthia which he thought might be a hybrid of *A. atrata* and *A. vulgaris*.

Aquilegia atrata is occasionally listed in the American trade and some of these plants seem like the wild ones so named. Some garden plants obtained as *A. sibirica*, *A. Reuteri*, *A. nigricans*, *A. stellata*, and *A. thalictrifolia* are nearer to *A. atrata*. *A. erecta* Hort. and vars. *atrocærulea* and *nana atroviolacea* Hort. with dark sometimes double, sometimes erect flowers may belong here.

A supposed hybrid between *A. atrata* and *A. vulgaris* (*A. oenipontana* Kern. ex Dalla Torre & Sarnthein, Fl. Tirol, vi, 2, 232, 1909) was proposed from Innsbrucken, but without description.

29. **Aquilegia nigricans** Baumg. Enum. Stirp. Transsilv. ii, 104 (1816). Fig. 17.

A. vulgaris var. *nigricans* Schur, in Verh. Siebenb. Ver. Naturw. iv, 31 (1853).

A. vulgaris subsp. *typica* var. *nigricans* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 290 (1893).

A. Sternbergii Reichb. Fl. Germ. Exc. 749 (1832).

A. vulgaris var. *Sternbergii* Baker, in Gard. Chron. ser. 2, x, 76 (1878).

A. vulgaris subsp. *cærulescens* f. *Sternbergii* Rapaics, Bot. Közlem. viii, 134 (1909).

A. alpina Haenke in Jacq. Coll. ii, 39 (1788), not Linn. 1753.

A. Haenkeana Koch, Syn. Fl. Germ. Ed. 2, 23 (1843).

A. vulgaris var. *alpestris* Kittel, Taschenb. Fl. Deutschl. Ed. 3, 868 (1853).

A. atrata var. *macrantha* Schur, Enum. Pl. Transsilv. 29 (1866).

A. subscaposa Borbás, in Magyar Tudom. Akad. xii, no. 6, 18 (1882).

A. glandulosa Auth. not Fischer.

Stems 3–6 dm. high, 1.5–4 mm. thick near base, scattered-pilose below, densely so and rather glandular above, often dark in color, simple to few-branched above: basal leaves ternate to biternate (with leaflets then subsessile), petioles 5–17 cm. long, somewhat pilose; petiolules mostly 1–4 cm. long, pilose; leaflets broadly cuneate-obovate to suborbicular, green and subglabrous above, glaucous and more or less pubescent beneath, 1–2 (2.5) cm. long, if ternate 3-cleft to near base, if biternate cleft to about the middle, then the divisions mostly 2–3-lobed or toothed with rounded-oblong teeth 2–5 mm. wide; petioled cauline leaves usually 1 or 2, sometimes 0; upper sessile bracts 1–3–5-lobed, 5–20 mm. long: pedicels mostly short; flowers mostly 1–3 to a stem, deep blue-violet; sepals spreading, ovate-lanceolate to broadly elliptic, subacuminate, subglabrous, 25–35 mm. long, 10–12 mm. wide; laminæ oblong-obovate, 11–14 mm. long, 8–10 mm. wide, more or less truncate; spurs strongly hooked, 13–15 mm. long, 5–6 mm. wide near base, pubescent; stamens mostly 1–2 mm. longer than laminæ, anthers tending to be dark, 1–2 mm. long; staminodia crinkled, rather blunt, 6–7 mm. long: follicles mostly 5, glandular-pubescent, not seen in maturity; styles pubescent, about 7 mm. long.

Type locality, "In alpibus Rodnensibus," eastern Hungary. Apparently growing in limestone mountains, from southern Tyrol to Bulgaria and Montenegro. Representative specimens seen: Carniola, *J. Ball* collected May 19, 1862, *Dolliner 205;* Carinthia, *Baron v. Jabornegg 893* and collected June 1862 and 1880; Galicia, *J. Ullepitsch 2704;* Hungary, *G. Bujorean 1231, G. & J. Wolff 2081.*

This species differs from *A. atrata* by the glandular pubescence on the stems, larger blue flowers, mostly smaller leaflets, and more eastern range.

Aquilegia nigricans is only sparingly cultivated; some material offered under this name has somewhat larger leaflets than in wild plants. Some of it is more like *A. atrata.* Some so-called *A. Reuteri* belongs to *A. nigricans. A. nigricans* vars. *alpina* and *subalpina* Hort. have also been listed.

30. **Aquilegia aurea** Janka, in Oesterr. Bot. Zeitschr. xxii, 174 (1872). Fig. 11.

A. chrysantha var. *aurea* Davis, in Minn. Bot. Studies, ser. 2, iii, 341 (1899).

A. sulphurea Zimmeter, in Fünft. Jahres-Ber. Staats-Ober-Realsch. Steyr, 38 (1875).

A. vulgaris subsp. *glandulosa* var. *sulphurea* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 303 (1893).

Stems 1–4 dm. high, 1.5–3 mm. thick, subglabrous or somewhat pilose, 1–3–(4–) flowered: basal leaves well developed, biternate, the petioles slender, 1–3 dm. long, subglabrous to somewhat pilose; primary petiolules 1.5–4 cm. long, more or less pilose; leaflets nearly or quite sessile, cuneate-obovate to suborbicular, green and glabrous above, pubescent and more or less glaucous beneath, 1.5–2.5 cm. long, 2–3-fid to half or more their length, then with linear-oblong lobes mostly 2–3 mm. wide; petioled cauline leaves usually 1–2, reduced; upper bracts sessile, with 1-several lance-elliptic lobes 1–2 cm. long: pedicels short; flowers suberect, sulfur-yellow; sepals oblong-ovate, 2–3 cm. long, 1–1.5 cm. wide, obtusish, pubescent without; laminæ oblong-obovate, slightly rounded at apex, 1.5–2 cm. long, 10–12 mm. wide; spurs hooked, 13–15 mm. long, 4 mm. wide at base, glabrous; stamens about 1 cm. shorter than laminæ, anthers yellow, about 1 mm. long; staminodia acute, somewhat crinkled, about as long as stamens: follicles pubescent, not seen in maturity.

Type locality, Mt. Perimdagh, eastern Macedonia. Known only from the mountains of Bulgaria and Macedonia, and is noteworthy as the only yellow-flowered species of Europe, differing from the New World species of the same color by its hooked spurs. Specimens seen: Bulgaria, *Stojanoff, Stefanoff & Georgieff*, collected July 1929; Macedonia, *J. Bornmüller 3288*.

I have seen *A. aurea* listed in one American catalogue, but have seen none of this firm's material. A species with the large yellow flowers and hooked spurs of *A. aurea* would be a novelty worth having in the garden.

31. **Aquilegia Kitaibelii** Schott, in Verh. Bot. Zool. Ver. Wien, iii, 129 (1853). Fig. 18.

A. pyrenaica var. *Kitaibelii* Fiori, Nuova Fl. Anal. d'Ital. i, 682 (1924).

A. vulgaris subsp. *viscosa* var. *Kitaibelii* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 297 (1893).

A. viscosa Waldst. & Kit. Descr. Icon. Pl. Hungar. ii, 184, t. 169 (1805), not Gouan.

A. pyrenaica Vis. Fl. Dalm. iii, 92 (1852), not DC.

Stems 1.5–3 dm. high, 1–1.5 mm. thick, sparsely glandular-pilose below, more densely so above, mostly 1–3-flowered: basal leaves biternate, the petioles slender, mostly 3–7 cm. long, pilose, petiolules 0.5–1.5 cm. long;

18. AQUILEGIA KITAIBELII at the lower left. AQUILEGIA THALICTRIFOLIA to the right. Flower of AQUILEGIA GRATA at upper left x ½, the sepal and petal x 1.

leaflets quite sessile, crowded, cuneate-obovate, 5–15 mm. long, shallowly 2–3-fid, the lobes mostly oblong-ovate and not further divided, grayish or brownish, somewhat pilose on both surfaces but more densely so and glaucous beneath; cauline leaves lacking or 1 or 2, these ternate and petioled, the upper bractlets 1–3-lobed, sessile, 5–15 mm. long: flowers suberect, red-violet or blue-violet; sepals spreading, ovate, 1.6–2 cm. long, 0.8–1.1 cm. wide, acute to obtusish, somewhat ciliate and pubescent toward apex; laminæ oblong-obovate, 10–13 mm. long, 7–10 mm. wide, somewhat rounded at apex; spurs slightly curved, 5–10 mm. long, glabrous, 3–4 mm. wide near base; stamens 2–3 mm. shorter than laminæ, anthers yellow, 1 mm. long; staminodia 5, sharply acute, 5–6 mm. long, somewhat crinkled: follicles 5, glandular-pubescent, perhaps 8–10 mm. long, the pubescent styles another 6 mm. long; seeds not seen.

Type locality, "Croatia." Growing on calcareous cliffs in Croatia, Bosnia and Hercegovina. Specimens seen: *M. Tommasini, Degen* collected August 3, 1906 and July 30, 1906.

The long hair on stems and leaves, the large flowers, and the short spurs distinguish this species.

Aquilegia Kitaibelii is occasional in cultivation, but not all material so labelled is correctly identified, some of it being too reddish and with spurs too long.

32. **Aquilegia Einseleana** F. W. Schultz, in Arch. Fl. France et Allem. 135 (1848); Flora, xxxi, 153 (1848). Fig. 19.

A. pyrenaica var. *Einseleana* Schultz, in Flora, xxxiv, 222 (1851).

A. vulgaris subsp. *viscosa* var. *Einseleana* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 297 (1893).

A. pyrenaica Reichb. Fl. Germ. Exc. 749 (1832), not DC.

A. viscosa Reichb. op. cit. 748, not Gouan.

A. Einseleana f. *Reichenbachii* Pampanini, in Nuovo Giorn. Bot. Ital. xli, 21 (1909).

A. Einseleana f. *intercedens* Pampanini, l. c.

A. Bauhinii Schott, in Verh. Bot. Zool. Ver. Wien, iii, 128 (1853).

A. Facchini Arcang. Comp. Fl. Ital. Ed. 2, 242 (1894), error for *Bauhinii*.

A. Einseleana var. *Bauhinii* Rapaics, in Bot. Közlem. viii, 132 (1909).

A. confusa Rota, Prosp. Fl. Burgamo, 99 (1855).

A. Portæ Huter, in Oesterr. Bot. Zeitschr. liii, 495 (1903).

A. Einseleana var. *Portæ* Gürke in Richter-Gürke, Pl. Eur. ii, 425 (1903).

19. AQUILEGIA BERTOLONII to the left. AQUILEGIA EINSELEANA to the right.

Stems 1–4.5 dm. high, 1–1.5 mm. thick, subglabrous below, weakly glandular-pubescent above, subsimple to few-branched above: basal leaves few, mostly biternate, subcoriaceous, subglabrous on both surfaces or somewhat pilose beneath, glaucous beneath; petioles up to 12 cm. long, slender, subglabrous, primary petiolules up to 3 cm. long, subglabrous; leaflets sessile or subsessile (sometimes not completely separated), narrowly to broadly cuneate-obovate, 0.5–2.2 cm. long, rather shallowly 2–3-fid, sometimes with additional smaller teeth, the final lobes broadly rounded-oblong; lower stem-leaf usually like a reduced basal leaf, the uppermost 1–3-lobed, sessile, the lobes linear, 1–2 cm. long: pedicels very slender, up to about 10 cm. long; flowers nodding, blue-violet; sepals spreading, oblong-lanceolate, 1.5–1.9 cm. long, 7–8 mm. wide, acute to acuminate, ciliate; laminæ oblong-obovate, rounded at apex, 8–10 mm. long, 6–9 mm. wide; spurs almost straight, pubescent, 7–10 mm. long, 2–3 mm. wide at base; stamens about 2 mm. shorter than laminæ, anthers yellow, about 0.6 mm. long; staminodia sharply acute, somewhat crinkled, about 5 mm. long: follicles 5, glandular-pubescent, 9–10 mm. long, with pubescent styles an additional 6–7 mm. long; seeds about 2 mm. long.

Type locality, Berchtesgaden, Bavaria. Ranging into northern Italy, Tyrol, and Carinthia where it grows in limestones at 4000–7000 feet. Representative specimens are: Bavaria, *A. Einsele 1707;* Tyrol, *Huter* collected August 8, 1872 and August 9, 1878, *A. S. Pease 13357;* Carinthia, *Pernhoffer 94, O. Krebs* September 1, 1898; Italy, *Daenen 6, M. A. Chrysler 2667, Wilczek* July 24, 1901, *St. Lager* July 1895, *Fiori, Béguinot & Pampanini 283.*

Aquilegia Einseleana is characterized by its subglabrous lower stems, subglabrous shallowly divided broad leaflets which are close together, stamens shorter than laminæ. There is some intergrading with *A. thalictrifolia* where the two come together (as in Val Vestino); such plants are the f. *intercedens* Pampanini. The leaflets of *A. Einseleana* are sometimes pilose beneath as in *A. Bertolonii*, but the flowers are smaller.

The species is sparingly cultivated, both *A. Einseleana* and *A. Bauhinii* having been offered in recent years by at least one American firm.

33. **Aquilegia thalictrifolia** Schott & Kotschy, in Verh. Bot. Zool. Ver. Wien, iii, 130 (1853). Fig. 18.

A. Bauhini var. *thalictrifolia* Ces. Pass. & Gib. in Comp. Fl. Ital. 872 (1884).

A. vulgaris subsp. *viscosa* var. *thalictrifolia* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 297 (1893).

A. pyrenaica var. *thalictrifolia* Fiori & Paoletti, Fl. Ital. i, 521 (1898).

A. Einseleana var. *thalictrifolia* Rapaics, in Bot. Közlem. viii, 132 (1909).

A. Einseleana var. *pseudo-thalictrifolia* Pampanini, in Nuovo Giorn. Bot. Ital. xxxviii, 43 (1906).

A. thalictrifolia f. *Cimarollii* Pampanini, op. cit. xli, 22 (1909).

A. thalictrifolia f. *intermedia* Pampanini, l. c., probably.

A. Einseleana var. *thalictrifolia* f. *medunensis* Zenari, in Nuovo Giorn. Bot. Ital. n. ser. xxxiv, 201–3 (1927).

Stems 2–6 dm. high, 1–2 mm. thick, glandular-pubescent throughout, mostly with several slender divaricate branches above: basal leaves few, mostly biternate, the petioles slender, glandular-pubescent, up to 2 dm. long; primary petiolules 3–6 cm. long, glandular-pubescent, the secondary 0.1–1 cm. long; leaflets cuneate-obovate, 1–3 cm. long, 1–2.5 cm. wide, glandular-pubescent on both surfaces, paler and sometimes glaucous beneath, usually 2–3-fid to near or below middle, these segments divergent, lance-oblong and entire or further toothed; lower cauline leaves 1 or 2, like the basal but reduced, the upper sessile, with 3 lance-linear entire divisions 1.5–2.3 cm. long, the uppermost simple and further reduced: pedicels several, very slender, densely glandular-pubescent, up to about 10 cm. long; flowers nodding to suberect, blue-violet; sepals spreading, lanceolate, about 2 cm. long, 7–8 mm. wide, subacuminate, pubescent on outer surface; laminæ cuneate-oblong, rounded at apex, 11–13 mm. long, 7–9 mm. wide, glabrous; spurs straight or somewhat curved, glabrous, 8–11 mm. long, 3–4 mm. wide near base; stamens barely exceeding laminæ, anthers yellow, scarcely 1 mm. long; staminodia about 5 mm. long, somewhat crinkled, acute: follicles 5, glandular-pubescent, 10–14 mm. long, the styles glandular-pubescent, an additional 5–6 mm. long; seeds 2 mm. long.

Type locality, Storo, Tyrol. Found in limestone mountains of south Tyrol, Lombardy, and Venetian Alps, at 2000–5000 feet; much less common than *A. Einseleana*. Specimens seen: Tyrol, mostly from Val Vestino, *P. Porta 93, 2107*, and collected June 14, 1869 and July 9, 1881; Lombardy, *P. Porta 284*.

Aquilegia thalictrifolia is characterized by its glandular pubescence, rather remote leaflets which are pubescent on both surfaces. *A. benacensis* may belong here; Boothman (Gard. Chron. ser. 3, xcv, 13, 1934) wrote: "This species was found by Mr. H. Correvon in 1913, on the mountains 'Del Lago d'Gardi' (Benaco), and is related to *A. Einseleana*, but has shorter stems and deep violet flowers. It appears to have been named *A. glutinosa* and *A. pseudo-thalictrifolia*, but still remains very indefinite."

This species is very rare in cultivation, the name listed in American trade perhaps twice in the past fifteen years, and one of those listings probably is applicable to *A. atrata*.

34. **Aquilegia Bertolonii** Schott, in Verh. Bot. Zool. Ver. Wien, iii, 127 (1853). Fig. 19.

A. pyrenaica subsp. *Bertolonii* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 295 (1893).

A. pyrenaica var. *Bertolonii* Fiori, Nuova Fl. Anal. d'Ital. i, 68 (1924).

A. Reuteri Boiss. Diagn. ser. 2, i, 10 (1853).

A. pyrenaica var. *Reuteri* Fiori, l. c.

A. Reuteri var. *minor* Rouy & Fouc. Fl. France, i, 127 (1893).

A. pyrenaica Reichb. Fl. Germ. Exc. t. 4732 (1840), not DC.

A. pyrenaica var. *decipiens* Gren. & Godr. Fl. France, i, 45 (1848).

Stems 1–3 dm. high, 1–2 mm. thick at base, scattered pilose to subglabrous below, glandular-pubescent above, 1–3-flowered: basal leaves few, biternate, the petioles 3–10 cm. long, somewhat pilose, petiolules 0.5–2.5 cm. long, pilose; leaflets sessile or sometimes not completely separated, broadly cuneate-obovate, 7–20 mm. long, subglabrous and greenish above, somewhat glaucous and pilose beneath, divergently 2–3-fid about half way to base, each division usually with 2–3 shallow broad oblong teeth; stems with or without 1 reduced petioled leaf and with 1-few subsessile bracts 1–2 cm. long and having 1 or 3 linear-lanceolate lobes: pedicels very slender, up to about 10 cm. long; flowers nodding, violet-blue; sepals spreading, elliptic-ovate, acute to acuminate, 18–33 mm. long, 9–14 (18) mm. wide, pubescent toward apex and along margins; laminæ oblong-obovate, rather truncate, 10–14 mm. long, 6–8 mm. wide; spurs straight or curved to hooked, 10–14 mm. long, 3–4 mm. wide near base, pubescent; stamens 1–2 mm. shorter than laminæ, anthers yellow, about 1.5 mm. long; staminodia sharply acute, 6–7 mm. long, somewhat crinkled: follicles pubescent, about 12 mm. long, the styles glandular-pubescent, an additional 8 mm. long.

Type locality, Apennine Mountains, Italy. Ranging from the mountains of southeastern France to Apennines of Italy, growing at 3500–5500 feet. I cannot separate the *A. Reuteri* of the Maritime Alps from *Bertolonii* of the Apennines, possibly the former is larger flowered. Nor am I sure which of these two names has priority. I refer the following collections to *A. Bertolonii:* Italy, Apennines, *J. Ball* collected July 1844, August 1844, July 3, 1866, 1862; Italy, Alpes Maritimes, *C. Bicknell & L. Pollini* on July 12, 1905, *Burnat* July 24, 1901, *Reuter* July 1843; France, *Don E. Malinvaud 2013, Palun* in 1821.

Aquilegia Bertolonii is near to *A. pyrenaica* but characterized by the pilose lower surface of the small leaflets, the broad sepals, and the stamens shorter than the laminæ.

Drummond and Hutchinson (Kew Bull. 1920, 146) called attention to the fact that *Isopyrum aquilegioides* Linn. (Sp. Pl. 557, 1753) based on Bauhin (Prodr. 75, 1620 and Pinax, 144, 1623) is an Aquilegia as shown by W. de Lachenal in a tract published at Basle in 1776, with an engraving. They follow him in believing it the same as *A. viscosa* Gouan, although its locality was given as "in Alpibus Helveticis" and Gouan's plant came from Lozère, France. It may be that the Linnæan name applies to and would have priority over *A. Bertolonii*. However, the figure published by de

Lachenal, with its small flower, exserted stamens, and simple upper bract-like leaves looks much like *A. thalictrifolia*. The specimen at Basle, if still extant, should be studied.

A number of American nurserymen list *A. Bertolonii* and *A. Reuteri* among their offerings; at least some of the *Reuteri* belongs to *A. nigricans*. Some plants received as *A. alpina* belong in *Bertolonii*. The name *A. cærulea* var. *Reuteri* Hort. is also listed; it is supposed to refer to a short-spurred lilac-blue flower and may well apply here.

35. **Aquilegia pyrenaica** DC. Fl. France, Ed. 3, v, 640 (1815). Fig. 20.

A. alpina Lam. Encyc. i, 150 (1789), not Linn.

A. vulgaris var. *pyrenaica* Walp. Ann. iv, 25 (1857).

A. vulgaris subsp. *pyrenaica* Hook. f. & Thoms. Fl. Brit. India, i, 24 (1872), as to name.

A. beata Rapaics, in Bot. Közlem. viii, 133 (1909), in part.

A. beata var. *condemnata* Rapaics, l. c.

A. vulgaris subsp. *pyrenaica* var. *vera* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 299 (1893).

Stems 1–3 dm. high, 1–2 mm. thick, subglabrous to glandular-pilose below, more densely so above, 1–3-flowered: basal leaves biternate, the petioles slender, subglabrous to glandular-pilose, 3–10 cm. long, the petiolules 1–4 cm. long, subglabrous to glandular-pilose; leaflets sessile or on short secondary petiolules, cuneate-obovate, often suborbicular, 5–15 (20) mm. long, subglabrous, greenish above, glaucous below, rather thick in texture, 2–3-fid to about the middle, the subparallel divisions in turn 2–3-lobed, blunt, oblong; petioled cauline leaves lacking or 1; sessile 1–3-lobed bracts 1-few, 5–15 mm. long: pedicels slender, up to about 1 dm. long; flowers nodding, bright lilac-blue; sepals spreading, ovate, 2–3.5 cm. long, 1–1.6 cm. wide, subacuminate, pubescent on outer surface; laminæ oblong-obovate, rounded at apex, pubescent without, 12–15 mm. long, 8–10 mm. wide; spurs slender, straight or slightly curved, pubescent, 10–16 mm. long, 3–4 mm. wide at base; stamens shorter than to about as long as laminæ, anthers yellow, 1.5 mm. long; staminodia crinkled, acute, 7–8 mm. long: follicles glandular-pubescent, about 13–17 mm. long, the pubescent styles an additional 8 mm. long.

Type locality, High Pyrenees. The species ranges throughout the Pyrenees at about 3000–5000 feet. Representative collections are: *Herbier Mouillefarine* August 24, 1891, *J. Ball* July 24, 1861, *J. Parseval* August 1853, *E. Doassans 1078*, *Hutchinson*, *Matthews & Riley 109*, *Bordère* August 1864, 1865, 1866, 1874, 1886, 1899, *Endress* August 1831, *Suizet* July 1889.

Aquilegia pyrenaica has larger flowers than *A. Einseleana* and *A. thalictrifolia;* it is very near *A. Bertolonii* and *A. alpina* and *A. Bernardii*.

From *A. Bertolonii* it differs by its glabrous leaves, longer follicles; from *A. alpina* by its usually smaller flowers and fruits; and from *A. Bernardii* by its shorter laminæ and follicles.

Being a pretty compact plant, this species would be expected to be useful for rock-gardens, especially since it is said not to lose its color in cultivation as *A. alpina* is likely to do (Gard. Chron. ser. 3, xcv, 408, 1934). In England it is said to be easily obtained true to name. It is offered by many American dealers; garden material I have seen was too large for the species and more like *A. Kareliniana*.

36. **Aquilegia aragonensis** Willk. in Willk. & Lange, Prodr. Fl. Hisp. iii, 966 (1880).

A. discolor var. *aragonensis* Gürke in Richter-Gürke, Pl. Eur. ii, 425 (1903).

A. pyrenaica var. *discolor* f. *aragonensis* Willk. Suppl. Prodr. Fl. Hisp. 321 (1893).

Stems densely pubescent throughout, 1–1.5 dm. high, simple, mostly 1-flowered: leaves all basal, ternate, small, densely puberulent on petiole and leaflets, latter roundish, subcordate, trifid, the segments with rounded lobes: flowers pendent, small, intensely blue, puberulent; sepals lanceolate, greenish at apex, about 1 cm. long; laminæ obtusely rounded, about 6 mm. long; spurs straight or slightly curved, longer than laminæ; stamens exserted, anthers yellow; staminodia linear-acute, crinkled: follicles pubescent.

Type locality from eastern Pyrenees (between Torla and Boucharo?). The flowers are very much smaller than in *A. pyrenaica* and the leaves not glabrous. No material has been seen, either wild or cultivated.

37. **Aquilegia discolor** Levier & Leresche, in Journ. Bot. xvii, 197 (1879); Deux Excursions Bot. t. 6 (1880).

A. pyrenaica var. *discolor* Willk. Suppl. Prodr. Fl. Hisp. 321 (1893).

A. vulgaris subsp. *pyrenaica* var. *discolor* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 299 (1893).

A. beata var. *discolor* Rapaics, in Bot. Közlem. viii, 133 (1909).

Stems 1–3 dm. high, subglabrous below, glandular-pubescent above, 1–2-flowered: basal leaves biternate, almost flat on ground; leaflets rounded-obovate, 1–1.5 cm. long, glabrous, slightly glaucous beneath, with rounded lobes; cauline leaves reduced, the upper with 1–3 narrow lobes: flowers nodding in bud, more erect at anthesis, pubescent on outside; sepals blue, ovate-lanceolate, spreading, 1.2–2 cm. long; laminæ whitish, rounded, 6–10 mm. long; spurs blue, 6–10 mm. long, somewhat incurved; stamens slightly surpassing laminæ, anthers yellow.

From Picos de Europa above Potes, Cantabria, Spain, the type from an elevation of 7000 feet. The bicolored smaller flowers readily distinguish the species from *A. pyrenaica*. I have seen no specimens of wild plants.

The name *discolor* is listed in a number of nursery catalogues. One such plant grown at Ithaca seemed to fit the description except that the flowers were nearly white.

38. **Aquilegia Bernardii** Gren. & Godr. Fl. France, i, 45 (1847); Briquet, Prodr. Fl. Corse, i, 586 (1910). Fig. 20.

A. vulgaris var. *Bernardi* Baker, in Gard. Chron. ser. 2, x, 76 (1878).

A. alpina var. *Bernardi* Fiori & Paoletti, Fl. Anal. d'Ital. i, 520 (1898).

A. corsica Soleir. ex Nym. Consp. 18 (1878).

Stems 5–8 dm. high, robust, glabrous below, glandular-pubescent above, branched: basal leaves biternate, with large leaflets deeply 2–3-more-fid, with incised lobes which are rounded, entire or slightly crenulate, glabrous, green above, paler beneath; cauline leaves 1–4, passing above into bracts with 1 or more lanceolate lobes: flowers nodding, pale blue; sepals spreading, broadly oblong-ovate, abruptly contracted and reflexed at apex, 2.5–3.5 cm. long, up to 1.5 cm. wide; laminæ obovate, rounded at apex, 1.5–2 cm. long, 1.5 cm. wide; spurs slender, straight or curved, 1.5–1.7 cm. long; stamens shorter than laminæ, anthers yellow; staminodia acute, crinkled: follicles glandular-pubescent, 2–2.5 cm. long, the pubescent styles an additional 1–1.5 cm.; seeds 2–2.5 mm. long.

Calcareous places at 4500–7000 feet in mountains of Corsica. No specimens have been seen. The species is apparently not in cultivation in America.

39. **Aquilegia nevadensis** Boiss. & Reut. Cat. Hort. Genev. 4 (1854); Ann. Sci. Nat. ser. 4, ii, 380 (1854).

Stems 1.5–6 dm. high, glandular-pubescent, branched above: basal leaves biternate, petioles viscid-pubescent; leaflets cuneate-obovate to almost round, glaucescent, glandular-pubescent on both surfaces, trifid, the segments apically 4–5-lobed; cauline leaves ternate: flowers nodding, smaller than in *A. vulgaris*, pale blue; sepals spreading, oblong-lanceolate, greenish at apex, long-attenuate; laminæ rounded-truncate; spurs straight or slightly curved, longer than laminæ; stamens exceeding laminæ; staminodia lanceolate, crinkled: follicles viscid-puberulent.

Type locality "ad rivulos Sierra Nevada," Spain, where it grows at 4000–6000 feet. The leaves are more glandular-pubescent than in related species from Spain. No material has been seen, either wild or cultivated, which fits the description. The name is occasionally listed by nurserymen.

20. AQUILEGIA ALPINA to the right, with sepal, staminodium, and petal in upper center. AQUILEGIA PYRENAICA, lower left. Flower of AQUILEGIA BERNARDII upper left.

40. **Aquilegia grata** F. Maly apud Zimmeter, Verw.-Verh. Eur. Aquil. 46 (1875). Fig. 18.

A. vulgaris subsp. *grata* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 299 (1893).

A. Ottonis var. *grata* Rapaics, in Bot. Közlem. viii, 131 (1909).

Stems 1.5–4.5 dm. high, glandular-pilose throughout, mostly 3–5-flowered: basal leaves biternate, the petioles up to 1 dm. long, glandular-pilose; leaflets glandular-pilose on both surfaces, greenish above, grayish beneath, cuneate-obovate, up to 4 cm. long, trifid about one-third way, then weakly toothed, the divisions contiguous to overlapping; lower cauline leaves petioled, uppermost 1–3-parted with linear glandular-pilose lobes 1–2 cm. long: flowers nodding, becoming erect, mauve-violet (to reddish in age); sepals ovate, 2.9 cm. long, 9–11 mm. wide; laminæ 6–10 mm. long; spurs straight, 1.4–2 cm. long; stamens surpassing laminæ by 3–5 mm.; staminodia crinkled, 7 mm. long: follicles 1.5 cm. long, glandular-hairy; seeds 2 mm. long.

Type locality, Bia Gora, probably in Dalmatia. Ranging in Bosnia, Hercegovina, Serbia. Not seen, either from wild or garden plants, the illustration given being copied. The glandular-pilose foliage is characteristic. The name is occasional in the trade.

41. **Aquilegia alpina** Linn. Sp. Pl. 533 (1753). Fig. 20.

A. vulgaris subsp. *alpina* Hook. f. & Thoms. Fl. Brit. India, i, 24 (1872), as to name only.

A. montana Sternb. in Regensb. Denkschr. ii, 60 (1818), not t. 4.

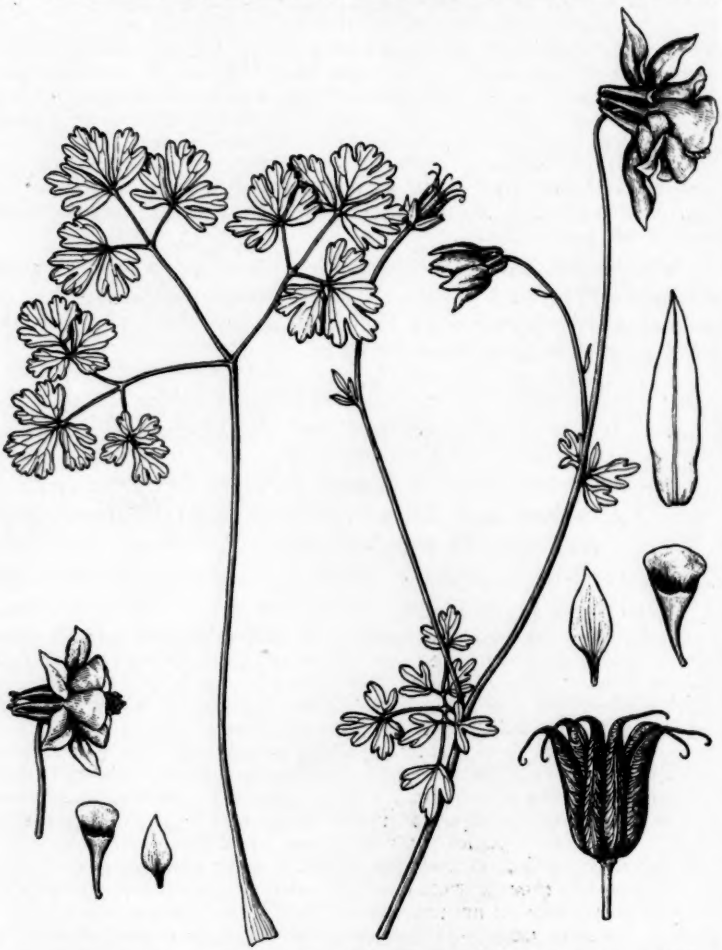
A. vulgaris subsp. *alpina* var. *typica* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 289 (1893).

Probably *A. Reuteriana* Reichb. f. ex Nym. Consp. 18 (1878), pro syn.

Stems 1.5–5 (8) dm. high, mostly 1–2 mm. thick and sparsely pilose below, densely pubescent above, 1–3-flowered: basal leaves biternate, the petioles slender, 5–20 cm. long, subglabrous to sparsely pilose; primary petiolules mostly 1–4 cm. long, subglabrous to somewhat pilose, secondary 0–5 (10) mm. long; leaflets membranaceous, cuneate-obovate to orbicular-ovate or wider, mostly 1–3 cm. long, nearly or quite glabrous, green above, somewhat glaucous beneath, 2–3-fid to about the middle, then with rather deep narrow oblong lobes mostly 1.5–2.5 mm. wide; petioled stem-leaves 1–3, gradually reduced upward; upper bracts with 1–3 (5) linear-oblong lobes 1–2.5 cm. long: pedicels to about 1 dm. long; flowers nodding, bright blue; sepals spreading, lance-ovate to wider, 3–4.5 cm. long, 1.4–2.2 cm. wide, somewhat greenish-yellow at the acute to subacuminate tip, subglabrous to pubescent; laminæ oblong, rounded and sometimes retuse at apex, 14–17 mm. long, 8–11 mm. wide; spurs rather coarse, straight to strongly curved (almost hooked), 18–25 mm. long, 6–7 mm. wide at base, pubescent; stamens 2–6 mm. shorter than laminæ, anthers yellow, almost

2 mm. long; staminodia somewhat crinkled, sharp-pointed, 6–7 mm. long; follicles 5–7, erect, pubescent, 20–28 mm. long, the styles 6–7 mm. additional.

Type locality, "Habitat in Helvetia." A plant of the Alps from eastern France to Switzerland, Tyrol (Vorarlberg) and northern Italy, at 4800–6800 feet altitude. Representative specimens are: France, *Delavay* August



21. AQUILEGIA FRAGRANS. Flower and separate sepal and petal of AQUILEGIA MOORCROFTIANA at lower left.

29, 1860, *Jeanpert* August 17, 1912, *Reverchon* August 10, 1870, *Lannes 2633;* Italy, *C. Bicknell* August 3, 1890, *E. Rostan* in 1880; Switzerland, *C. Spiess* July 24, 1877, *R. Masson* July 1887, *Louis & Emile Gross, J. Ball* August 1845, *Mary F. Spencer* July 20, 1901, *Krättli* in 1876, August 1871, July 1867.

Aquilegia alpina is placed among the straight-spurred species, but often its spurs curve sufficiently to be confusing. It differs from related European species by its large flowers and the leaflets with narrow ultimate lobes which are not glandular. It is one of the most beautiful of all Aquilegias.

A. alpina var. *minor* Rouy & Fouc. (Fl. France ii, 322, 1895) from Department Isère, France, is supposed to be 1.5–3 dm. high, with flowers one-third smaller. I have not seen any material.

A. alpina f. *gracilis* Chenevard & J. Braun (see Hegi, Ill. Fl. Mit.-Eur. iii, 483, 1909) is said to be 1.6–2 dm. high; follicles 3, 18 mm. long; from Tessin, Switzerland.

A supposed hybrid with *A. atrata* has been described (*A. Cottia* Beyer, in Verh. Bot. Ver. Brand. liv, 238, 1913; *A. alpino-atrata* Rostan, reference not found) with flowers light lilac-brown; sepals narrower than in *alpina*, wider than in *atrata;* intermediate in size; spurs uncinate.

Aquilegia alpina has been cultivated for a very long time and the name is still common in the trade, but most of the plants so offered are nearer to *A. vulgaris* in their broadly lobed leaflets and hooked spurs than they are to *A. alpina*, and some are *A. Bertolonii*. Various forms are listed: var. *alba* Hort., var. *atrocærulea* Hort., var. *atroviolacea* Hort., var. *cærulea* Hort., var. *grandiflora* Hort. and var. *superba* Hort. Some of these tested at Wisley in 1927 were reported as of "mixed stock" (Journ. Roy. Hort. Soc. liii, 163–164, 1928).

42. **Aquilegia fragrans** Benth. in Maund, Botanist, iv, t. 181 (August 1840; for date see Britten, in Journ. Bot. lvi, 243, 1918). Fig. 21.

A. vulgaris subsp. *Moorcroftiana* var. *fragrans* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 305 (1893).

A. kanaoriensis var. *suaveolens* Camb. in Jacquem. Voy. Bot. 7 (1844).

A. vulgaris subsp. *Moorcroftiana* var. *suaveolens* Brühl, op. cit. 309.

A. suaveolens Brühl ex Durand & Jackson, Ind. Kew. Suppl. i, 34 (1902).

A. glauca, Lindl. in Bot. Reg. xxvi, t. 46 (1840); given also as August, but must have been later than *A. fragrans*, since Lindley tells how he considers it different from that species.

A. vulgaris subsp. *Moorcroftiana* var. *glauca* Brühl, op. cit. 306.

A. glauca var. *himalayica* Rapaics, in Bot. Közlem. viii, 132 (1909).

Apparently *A. vulgaris* subsp. *alpina* Hook. f. & Thoms. Fl. Brit. India, i, 24 (1872).

A. vulgaris subsp. *pyrenaica* Hook. f. & Thoms. l. c., in part.

A. vulgaris subsp. *alpina* var. *himalaica* Brühl, op. cit. 294.

Stems 4–8 dm. high, up to 4 mm. thick, pilose, with some hairs gland-tipped, usually with several divaricate branches: basal leaves 2–3-ternate, the petioles 10–25 cm. long, pilose; primary petiolules 2–6 cm. long, secondary ones 0.5–3 cm. long, both somewhat pilose; leaflets of thin texture, cuneate- to rounded-obovate, more or less glaucous, greener and glabrous above, paler and usually somewhat pubescent beneath, 2–4 cm. long, from somewhat narrower to somewhat wider, generally 3-cut to near base, then 2–3-lobed and with ultimate oblong teeth; cauline leaves several, gradually reduced upward, the floral bracts usually 1–2 cm. long, with 1–3 lanceolate acuminate segments: flowers several, fragrant, horizontal to somewhat nodding; sepals somewhat pubescent, whitish to purplish, mostly lance-ovate, spreading, 25–30 mm. long, 10–12 mm. wide, obtusish to acute; laminæ cuneate-oblong, truncate, somewhat puberulent, 15–18 mm. long, 12–14 mm. wide, tending to be paler; spurs straight or somewhat curved, 15–18 mm. long, about 3 mm. wide near base; stamens about equalling laminæ, anthers yellow, about 2 mm. long; staminodia about 8 mm. long, 3 mm. wide; styles exceeding stamens in anthesis: follicles 6–9, about 2 cm. long, densely pubescent, the styles about 8 mm. long, more or less pubescent; seeds black, shining, about 2 mm. long.

Type locality, north India. Ranging mostly at 8000–12,000 feet elevation in Kashmir and Punjab. It varies in size and glaucous condition of leaves, but I have been unable to recognize more than one entity. Representative specimens: Kashmir, *R. R. & I. D. Stewart 18971, 18767, R. R. Stewart 20798, 20895, 19685, 9953, 5363a, 9913, 18488, T. Thomson, W. Koelz 9117, 9300;* Punjab, *W. Koelz 557, 8568, M. Nath 267, Strachey & Winterbottom 1.*

This species is known in the trade mostly as *A. suaveolens* and rarely as *A. glauca*. Some such plants belong to *A. fragrans*, some nearer to *A. pubiflora*. It is said to have been introduced into cultivation in England by the East India Company in 1846 (Baker, in Gard. Chron. ser. 2, x, 76, 1878, as *A. glauca*). The fragrance is very sweet and distinctive. It and the large laminæ can be detected in the hybrids.

43. **Aquilegia Moorcroftiana** Wall. Cat. no. 4713 (1830), nomen; Wall. ex Royle, Ill. Bot. Himal. i, 55 (1834). Fig. 21.

A. vulgaris subsp. *Moorcroftiana* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 304 (1893).

A. Moorensteniana Steud. Nom. Ed. 2, i, 115 (1840), sphalm.

A. kanaoriensis Jacquem. ex Camb. in Jacquem. Voy. Bot. 7, t. 5 (1844).

A. vulgaris subsp. *Moorcroftiana* var. *kanaoriensis* (spelled *kunaorensis*) Brühl, op. cit. 306.

Probably *A. vulgaris* subsp. *Moorcroftiana* var. *Wallichiana* Brühl, l. c.

Probably *A. vulgaris* subsp. *Moorcroftiana* var. *subaphylla* Brühl, op. cit. 307.

A. vulgaris subsp. *pyrenaica* Hook f. & Thoms. Fl. Brit. India, i, 24 (1872), in part.

A. vulgaris subsp. *viscosa* Hook. f. & Thoms. l. c., not *A. viscosa* Gouan.

A. vulgaris subsp. *vulgaris* Hook. f. & Thoms. l. c., not *A. vulgaris* Linn.

Plants mostly 2–4 dm. high, the stems 2–3 mm. thick below, pubescent and with some hairs gland-tipped, mostly 2–several-flowered: basal leaves mostly biternate, the petioles 5–15 cm. long, pilose and glandular-pubescent; primary petiolules mostly 1–2 cm. long, secondary 1–5 (15) mm. long; leaflets thickish, glaucous, crowded, 1–2 cm. long, obovate, 2–3-fid half way or more to base, the divisions with 2–3 oblong lobes, glabrous above, somewhat pubescent beneath; cauline leaves usually several, gradually reduced upward into bracts about 1 cm. long, with 1–3 lanceolate lobes: flowers mostly nodding; sepals purplish to blue-purple, spreading, lance-ovate, 13–18 mm. long, 6–8 mm. wide, acute to obtusish, somewhat puberulent; laminæ blue to yellowish-tipped, obovate, rounded at apex, 10–13 mm. long; spurs purplish, straight or slightly curved, 12–17 (19) mm. long, 2.5–3.5 mm. wide near base; stamens slightly longer than laminæ, anthers yellowish, 1–1.5 mm. long; staminodia 6 mm. long, lanceolate: carpels 5–6, pubescent, 16–24 mm. long, the styles pubescent at least on lower parts, 7–10 mm. long; seeds black, shining, 1.7 mm. long.

Type locality, Ladak, Kashmir. At elevation of 12,000–16,000 feet, in mountains from Kashmir to Garhwal and Tibet. Specimens seen: Kashmir, *Stewart 7. W. Koelz 2647, 2756, 6652, 6624, 5753, T. Thomson;* Punjab, *W. Koelz 5390;* Tibet, *Schlagintweit 6523, 6262, 3195, 2300.*

Aquilegia Moorcroftiana and *A. fragrans* seem essentially alike in morphology, except that the former, from higher elevations, has all parts (stature, leaflets, floral parts) reduced and tends to be of darker color.

Aquilegia Moorcroftiana was introduced into English gardens in 1852 (see Baker, in Gard. Chron. ser. 2, x, 76, 1878) and is very sparingly listed by nurserymen of today. One garden plant I have seen offered as *A. glandulosa* seems to me nearer to *A. Moorcroftiana. A. Moorcroftiana* var.

lactiflora Hort. is also listed and described as having some double flowers, some spurless; most are rosy-lilac.

44. **Aquilegia afghanica** Brühl ex Durand & Jackson, Ind. Kew. Suppl. i, 34 (1902). Fig. 3.

A. vulgaris subsp. *Moorcroftiana* var. *afghanica* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 307 (1893).

Stems 8–20 (30) cm. high, 1–2 mm. thick, from a very woody caudex, densely pilose and with some gland-tipped hairs, simple and 1-flowered, or 2–3–(5–) branched and -flowered: basal leaves biternate, petioles 3–7 cm. long, more or less pilose; primary petiolules 3–20 mm. long, pilose, secondary 1–10 mm. long; leaflets rather coriaceous, green on both surfaces, mostly glabrous above and pubescent beneath, round-obovate in outline, 5–15 mm. long, sometimes wider, mostly 2–3-cut to near base, the divisions in turn rather deeply lobed or toothed with final parts oblong; cauline leaves 2–several, gradually reduced, the uppermost 5–15 mm. long, with 1–3 lance-elliptic lobes: pedicels 2–8 cm. long, densely soft-pubescent with many hairs gland-tipped; flowers subhorizontal; sepals ovate-lanceolate, spreading, acute to subacuminate, apparently bluish, pubescent without and on upper part of inner surface, 15–18 mm. long, 6–8 mm. wide; laminæ truncate-obovate, 10–12 mm. long, 7–9 mm. wide, apparently paler, somewhat pubescent; spurs nearly or quite straight, 15–17 mm. long, about 2 mm. wide near base; stamens exceeding laminæ by 1–2 mm., anthers yellow, 1 mm. long; staminodia about 6 mm. long, 2 mm. wide; styles slightly longer than stamens, glandular-pubescent for two-thirds their length: follicles 5, glandular-pubescent, not seen in maturity.

Type locality, "in valle Kurrum—in monte Sikarâm" on boundary between Afghanistan and India. Specimens seen, all from Afghanistan: *J. E. T. Aitchison 219, 362,* and collected in 1879.

Obviously this species is closely related to *A. Moorcroftiana* in straight spurs and general floral characters, but smaller in stature, more pubescent throughout, leaflets tending to have narrower segments, floral parts smaller, of more western range.

Index Kewensis gives *A. afghanica* Brühl as a species but while it is there printed as a binomial it is not meant to be of more than varietal rank.

The plant is not in cultivation.

45. **Aquilegia viridiflora** Pall. in Nova Act. Acad. Petrop. 1779, 260, t. 11 (1783); Jacq. Icon. Pl. Rar. i, t. 102 (1783). Fig. 22.

A. lutea (sometimes erroneously given as *flava*) Lam. Encyc. i, 149 (December 1783).

A. atropurpurea Willd. Enum. Hort. Berol. 577 (1806).

A. atropurpurea var. *brevistyla* Willd. l. c.

A. atropurpurea var. *Fischeriana* DC. Prodr. i, 51 (1824).

22. AQUILEGIA VIRIDIFLORA, with petal, sepal, staminodium, and follicles at upper left. Flowers often more pendent than in this figure.

A. daourica DC. Syst. Nat. i, 338 (1817); Patr. in Deless, Icon. Sel. i, t. 49 (1820).

A. atropurpurea var. *dahurica* DC. Prodr. i, 51 (1824).

A. viridiflora var. *atropurpurea* Davis, in Minn. Bot. Studies, ii, 336 (1899).

Stems 2–5 dm. high, more or less finely pubescent throughout, with some gland-tipped hairs especially in upper parts, shorter stems subsimple, longer freely and openly branched: basal leaves biternate, the petioles up to 20 cm. long, somewhat pubescent; primary petiolules 1–4 cm. long, pubescent, secondary 1–10 mm. long; leaflets fairly thick in texture, green and subglabrous above, paler, glaucous and more or less pubescent beneath, 1–3 cm. long, as wide or wider, cuneate-obovate, mostly 3-fid to about the middle, then with 2–3 shallow oblong rounded lobes 2–4 mm. wide; cauline leaves 2-several, gradually reduced upward, the upper bracts 1–2 cm. long, varying from foliose and several-lobed or compound to lanceolate, 1–3-lobed, pubescent: pedicels on well developed stems several, up to about 8 cm. long; flowers inclined to nodding; sepals green, oblong-ovate, pubescent, obtuse, not strongly divergent, 11–14 mm. long, 6–7 mm. wide; laminæ yellow-green to brown-red to purplish, cuneate-obovate, very little rounded, from slightly shorter to slightly longer than sepals, almost as wide as long; spurs straight or slightly curved, pubescent, 10–18 mm. long, about 3 mm. wide near base; stamens usually somewhat exserted, anthers yellow, 1.5 mm. long; staminodia acute, 7–8 mm. long: follicles 5, densely glandular-pubescent, erect or somewhat divergent at apex, 10–15 mm. long; styles pubescent, 10–15 mm. long; seeds not seen.

Type locality, apparently Davuria (judging from Ledebour, Fl. Ross. i, 57, 1842). Ranging from Altai and Kansu to the Amur and Shantung. Representative specimens may be cited as follows: Davuria, *Ledebour, R. Maack 87;* Mongolia, *R. W. Chaney 134, H. Krascheninnkov & B. Zamatkinov 569, N. & V. Ikonnikov-Galitzky 1765, A. David 2650, P. H. & J. H. Dorsett 6304, K. Kobaiashi 7131, 8722;* China, *Father I. Trippner 381, R. C. Ching 61, B. E. Read R806, Bretschneider 5, H. W. Kung 92, Armacost 61, C. Y. Chiao 2178.*

Most material seen seems to have the dark colored flowers of *A. atropurpurea*, but since there seems to be no geographic correlation with color, it is not maintained even varietally. The species is set apart by having laminæ as long as sepals and styles about as long as follicles.

Aquilegia viridiflora is interesting rather than ornamental and it would scarcely be expected to rival other columbines in the garden. The purple form (*atropurpurea*) was listed among desirable species as early as 1858 (Gard. Chron. page 360, 1858), and it is this form which is still occasionally offered in the trade.

23. AQUILEGIA BUERGERIANA, a Japanese species with purplish sepals and yellowish laminæ.

46. **Aquilegia Borodinii** Schischk. in Mélang. bot. offerts à Mr. J. Borodin à l'occasion de son jubilé, 305 (1927); Krylov, Fl. Sibir. Occ. v, 1135 (1931); Komarov, Fl. U. R. S. S. vii, 91 (1937).

Stems 2–4 dm. high, apparently pubescent: basal leaves crowded, biternate, sparsely short-hairy, glaucous below, the petioles 7–15 cm. long, petiolules 1–5 cm. long; leaflets round-obovate, 1.5 cm. long, 1.5–2.5 cm. wide, terminal generally 3-lobed, the lateral 2-lobed: pedicels strongly arched, with upper parts usually with dense short red hairs; flowers pendent; sepals spreading, lilac-blue, ovate, acute, 1.5–2.2 cm. long, 0.6–1 cm. wide, pubescent; laminæ whitish, 8–10 mm. long, 5 mm. wide, rounded-truncate; spurs one and a half times the laminæ, straight except for the curved slender tip; stamens not exserted: follicles 5, densely short-hairy.

Endemic in the Sayansk Mountains, south-central Siberia, where it is reported from rocky places in alpine regions at elevations of 5000–8000 feet.

No material has been seen, nor is the plant in cultivation.

47. **Aquilegia Buergeriana** Sieb. & Zucc. in Abh. Akad. Muench. ser. 4, ii, 183 (1846). Fig. 23.

Stems commonly 5–8 dm. high, openly branched above, 2.5–3.5 mm. thick at base, sparsely pubescent to subglabrous below, glandular-puberulent above: basal leaves biternate, the petioles up to 15 cm. long, subglabrous to sparsely pubescent; primary petiolules 1–8 cm. long, scattered-pilose, secondary 2–8 (20) mm. long; leaflets mostly thickish in texture, commonly cuneate-obovate, 1–4 (5.5) cm. long, about as wide, greenish and glabrous above, more or less glaucous and sometimes with a few hairs beneath, 2–3-fid from half way to almost to the base, each segment with 2–3 rounded-oblong lobes; cauline leaves usually several, gradually reduced through once-ternate leaves to 1–5-lobed bracts 7–15 (25) mm. long: pedicels 5–15 cm. long; flowers nodding; sepals purple, lanceolate to lance-ovate, divergent, acute, 15–24 mm. long, 7–10 mm. wide, slightly puberulent near the apex; laminæ yellowish, 10–15 mm. long, truncate, sometimes slightly emarginate; spurs 14–19 mm. long, purplish, slightly curved, 1.5–2.5 mm. wide near base; stamens shorter than petals, anthers purplish, slightly more than 1 mm. long; staminodia 6–8 mm. long: follicles 5–7, densely pubescent, erect, 2–2.5 cm. long; styles 5–7 mm. long, more or less pubescent; seeds black, shining, about 1.5 mm. long.

Type locality not stated. Ranging apparently through central part of the Japanese island of Honshu, from which may be cited: *Beattie & Kurihara 10930, 10998, 10968, 10259, 10257, P. H. Dorsett & W. J. Morse 618, 378, T. Tanaka 128, G. Koizumi 19.*

A yellow-flowered type (apparently f. *flavescens* Makino, in Bot. Mag. Tokyo, xxiv, 141, 1910) grows with the typical form, as evidenced by the following collections from Honshu: *Dorsett & Morse 379, 532, Beattie & Kurihara 10995, 10961, 11091, K. Shiota 5898.*

Makino (Bot. Mag. Tokyo, xxvii, 252, 1913) describes a spurless plant from Nikko as var. *ecalcalata* (note spelling). I have not seen any material.

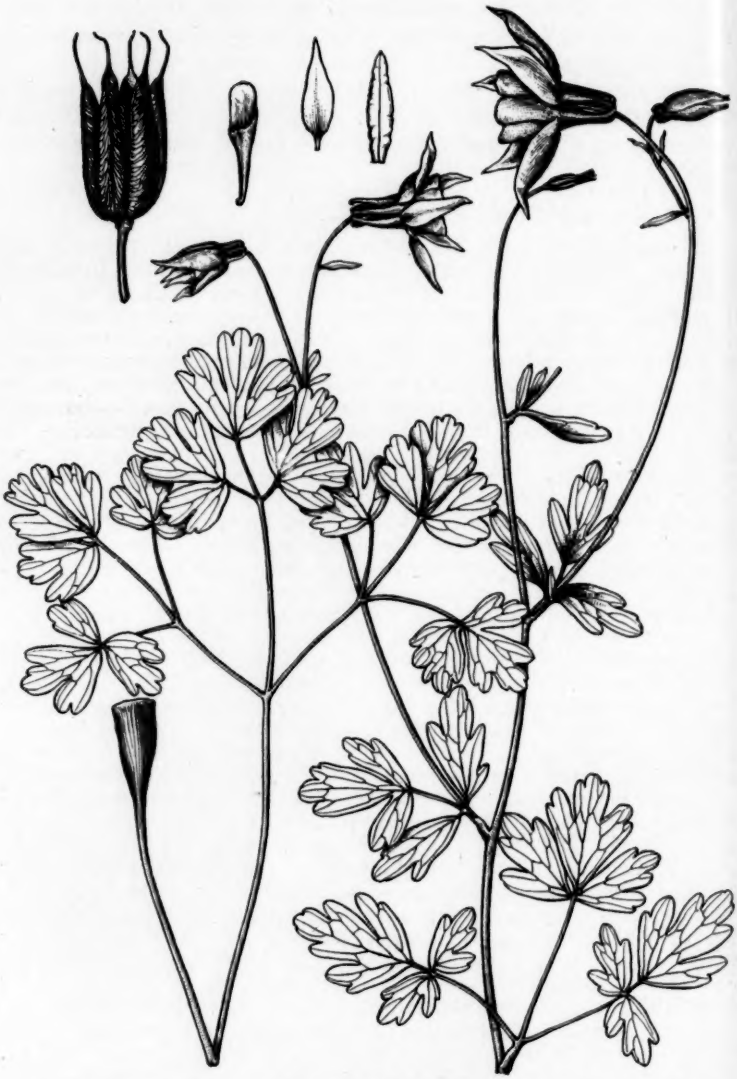
Aquilegia Buergeriana differs from other Asiatic species with short stamens and long spurs by its purple or yellow sepals and yellow laminæ and large leaflets.

According to Bailey (Stand. Cyclo. Hort. 341, 1922) *A. Buergeriana* was brought from Leningrad in 1892. It is offered by several dealers and at least some of their material is correctly named. Some plants sold as *A. akitensis* belong here.

† 48. **Aquilegia Rockii,** spec. nov. Fig. 24.

Stems mostly 5–8 dm. high, 3–6 mm. thick at base, tending to be dark in color, scattered-pilose below, densely glandular-pubescent in inflorescence, openly branched above, 3–10-flowered, the pedicels up to 15 cm. long: basal leaves few, biternate, the petioles 10–25 cm. long, dilated at base, scattered-pilose; primary petiolules 4–10 cm. long, scattered-pilose, secondary mostly 1–2 cm. long, more densely pilose; leaflets rather thin in texture, green and subglabrous above, glaucous and more or less soft-pubescent beneath especially toward their base, mostly cuneate-obovate in shape, 2–4 (5) cm. long, from nearly as wide to wider, the terminal 3–, the lateral 2-fid to near the middle, each division then with 2–3 or more rounded oblong lobes 2–6 mm. wide; cauline leaves usually 2 or more, the lower petioled and biternate, the upper sessile and reduced, and passing into the 1–3-parted bracts with entire oblong-linear to oblong-lanceolate divisions 1–2 cm. long, or more compound and foliose: flowers nodding or subhorizontal, blue to purplish-red, concolored; sepals spreading, oblong-lanceolate, acuminate, subglabrous or somewhat soft-pubescent, 22–32 mm. long, 7–9 mm. wide; laminæ oblong, rounded-truncate at apex, 12–16 mm. long, 6–7 mm. wide; spurs slightly curved toward tips, pubescent, rather slender, 17–20 mm. long, 3–4 mm. wide near base, scarcely enlarged at tips; stamens 2–3 mm. shorter than laminæ, anthers dark, about 1 mm. long; staminodia 6–7 mm. long, linear-oblong, rounded-obtuse but slightly apiculate, scarcely if at all crinkled on edges: follicles 5, densely glandular-pubescent, erect, 1.5–2.2 cm. long, the styles an additional 5–7 mm. long; seeds shining black, almost 2 mm. long, 1 mm. wide, cellular-punctate.

Caules 5–8 dm. alti, base 3–6 mm. crassi et sparsim pilosi, supra ramosi et dense glanduloso-pubescentes, cum 3–10 floribus: foliis basalibus paucis, biternatis; petiolis 10–25 cm. longis et sparsim pilosis; petiolulis primariis 4–10 cm. longis, sparsim pilosis, secondariis 1–2 cm. longis, densius pilosis; foliolis herbaceis, supra subglabris et viridibus, infra glaucis et pubescentibus, cuneato-obovatis, 2–4 (5) cm. longis et latis (aut latioribus), terminalibus trifidis, lateralibus bifidis, cum divisionibus 2–3-rotundato-lobatis; foliis caulium 2–4, inferioribus petiolatis et biternatis, superioribus sessilibus et reductis; bracteis foliosis et compositis vel cum 1–3 lobis integris oblongo-linearibus aut lanceolatis et 1–2 cm. longis: floribus nutantibus, cæruleis aut roseo-purpureis, concoloribus; sepalis patentibus, oblongo-lanceolatis, acuminatis, subglabris vel pubescentibus, 22–32 mm. longis, 7–9 mm. latis; laminis oblongis, apice rotundato-truncatis, 12–16 mm. longis, 6–7 mm. latis; calcaribus subrectis, pubescentibus, tenuibus, 17–20 mm. longis, base 3–4 mm. latis, apice vix crassitis; staminibus laminis 2–3 mm. curtioribus, antheris obscuris, 1 mm. longis; para-



24. Aquilegia Rockii, a new species from the interior of Asia, proposed in honor of its collector, Dr. J. F. Rock.

stemonibus 6–7 mm. longis, anguste oblongis, planis, rotundato-obtusis: folliculis 5, dense glanduloso-pubescentibus, erectis, 15–22 mm. longis; stylis 5–7 mm. longis; seminibus nigris, vix 2 mm. longis.

Type, "in forests and meadows" at 11,000 feet, Mount Siga, northeast of Kulu, Muli Kingdom, southwestern Szechwan, China; June 29, *J. F. Rock 17935* (type, United States National Herbarium 1510342, paratype in New York Botanical Garden).

The proposed species is near to *A. oxysepala* var. *kansuensis* Brühl and apparently ranges for the most part more to the east and at higher elevations. It differs from that plant by its straight spurs, concolored flowers, and more obtuse oblong plane staminodia. That the two apparently hybridize is evidenced by such collections as *Handel-Mazetti 4114* and *Rock 5215* from Yunnan, with spurs of *A. Rockii* and staminodia of *A. oxysepala* var. *kansuensis*, and by *Rock 12887* from Kansu and *Handel-Mazetti 9862* and *Maire 7442* from Yunnan with spurs of *A. oxysepala* var. *kansuensis* and staminodia of *A. Rockii*. Such intergradation where two species grow near together is of course to be expected.

A. Rockii ranges from southeastern Tibet to northwestern Yunnan and southwestern Szechwan as can be seen from the following collections: Yunnan, *J. F. Rock 22995, 22253, 22677, 23583, 23204;* Szechwan, *J. F. Rock 24428, 23885, 16408,* and *C. Schneider 1495.*

The species is not in cultivation.

49. **Aquilegia brachyceras** Fisch. & Mey. ex Turcz. in Bull. Soc. Nat. Mosc. xi, 86 (1838), nomen; Maund, Bot. Gard. 8, no. 755 (1827–42), with colored illustration.

A. leptoceras Fisch. & Mey. in Ind. Sem. Hort. Petrop. iv, 33 (1837), not *A. leptocera* Nutt. 1834.

A. vulgaris subsp. *leptoceras* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 309 (1893).

Stems 2–3 dm. high, quite glabrous below, or pubescent throughout, several-flowered: basal leaves ternate or biternate; petioles 4–8 cm. long; primary petiolules 1–2 cm. long; leaflets thin in texture, glabrous and green on both surfaces but paler beneath, cuneate-obovate, 15–20 mm. long, with few divisions which are in turn obtusely toothed; cauline leaves 1–3, passing upward into bracts: flowers nodding; sepals spreading, oblong-ovate, 18–22 mm. long, half as wide, purplish or lilac-blue with green tip; laminæ cuneate-obovate, round-truncate, 10–12 mm. long, dark tipped with yellow; spurs straight or nearly so, 15–18 mm. long, blue; stamens exceeding laminæ by 2–5 mm.: follicles 5, glabrous, divergent at apex, 2 cm. long; styles 6–7 mm. long; seeds shining.

Type locality not stated. It is said to grow in mountain forests of eastern Siberia. Since Nuttall's use of the name *leptocera* for a form of the

North American *cærulea* antedated by three years that of Fischer & Meyer for the Siberian plant, I have to give up that name for a somewhat more uncertain one, since *A. brachyceras* was proposed without much description.

No botanical specimens have been seen, nor any recent reference to this species in catalogues or horticultural literature.

50. **Aquilegia lactiflora** Kar. & Kir. in Bull. Soc. Nat. Mosc. xiv, 374 (1841). Fig. 25.

A. vulgaris subsp. *lactiflora* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 310 (1893).

A. Moorcroftiana var. *lactiflora* f. *typica* Korshinsky, in Bull. Acad. Sci. Pétersb. ser. 5, ix, 401 (1898).

25. AQUILEGIA LACTIFLORA, a white-flowered columbine from Semipalatinsk and Uzbek.

A. Moorcroftiana var. *lactiflora* f. *microphylla*, Korshinsky, l. c.

A. lactiflora var. *leucantha* Fisch. & Mey. Enum. Alt. Pl. Nov. a Schrenk Lect. 70 (1842).

A. lactiflora var. *dichroantha*, Fisch. & Mey. l. c.

A. Darwazi (*Darvasii*) Korshinsky, l. c.; reduced by Komarov, Fl. U. R. S. S. vii, 92 (1937).

Stems 4–8 dm. high, 1.5–3 mm. thick, more or less soft-pubescent or pilose throughout but specially so above, with some hairs gland-tipped: basal leaves ternate or biternate, the petioles up to 20 cm. long, pilose; primary petiolules 0.5–3.5 cm. long, pilose, secondary 0–0.5 cm. long; leaflets thin in texture, cuneate-obovate, green and subglabrous above, somewhat paler and more pubescent beneath, mostly 1–2 cm. long, about as wide, usually 2–3-fid about half their length, the divisions oblong, entire and up to 5 mm. wide, or with 2–3 oblong shallower lobes; stem-leaves usually 2 or more, the lower petioled and compound; uppermost bracteate, 1–3-lobed: flowers 1 to several, nodding, the pedicels up to 15 cm. long; sepals spreading to reflexed, almost white, broadly lance-oblong, 13–18 (20) mm. long, acutish, pubescent; laminæ broadly cuneate-oblong, slightly rounded at apex, 7–10 mm. long, whitish to yellow; spurs almost straight, 15–25 mm. long, 3–4 mm. wide at base, pubescent; stamens equalling or somewhat exceeding laminæ, anthers yellow, about 1 mm. long; staminodia obtuse, 7–8 mm. long: follicles 5–6, glandular-pubescent, 13–15 mm. long, the styles 6–7 mm. long; ripe seeds not seen.

Type locality, in the Tarbagatai Mountains on the rivers Dschanybek and Terekty. Range, mountains from Semipalatinsk southwest to Uzbek (Turkestan). The following specimens are representative: *Schischvin & Genina* collected in 1914, *A. Regel* June 21, 1882, *A. Michelson 2528*, *Baranov & Vassiljev 127*.

This species has the habit and size of *A. viridiflora*, but with sepals longer than laminæ, more reflexed, whiter. *A. lactiflora* suggests somewhat the American *A. micrantha* but is less glandular, has the stamens less exserted, and the flowers more definitely nodding.

Boothman (Gard. Chron. ser. 3, xcv, 352, 1934) gives *A. lactiflora* as in cultivation. The single American dealer whom I know to offer it wrote that he had to rogue considerably to get a white-flowered strain.

51. **Aquilegia flavescens** S. Wats. in Bot. King Expl. 10 (1871). Fig. 26.

A. cærulea var. *flavescens* Lawson, in Proc. & Trans. Roy. Soc. Canada, ii, 76 (1885); Rev. Canadian Ranunc. 75 (1870).

A. canadensis var. *flavescens* Davis, in Minn. Bot. Studies, ii, 335 (1899).

A. canadensis subsp. *americana* var. *flavescens* Rapaics, in Bot. Közlem. viii, 136 (1909).

26. AQUILEGIA FLAVESCENS, a western species near to *A. formosa* but with longer laminæ and more incurved spurs.

A. formosa flavescens Frye & Rigg, Northwest Fl. 165 (1912).

A. formosa var. *flavescens* Hook. f. in Bot. Mag. t. 6552 (1881).

A. canadensis var. *aurea* Roezl, in Gartenflora, xxi, 258, pl. 734 (1872).

A. depauperata Jones, in Contr. W. Bot. viii, 1 (1898).

A. canadensis var. *depauperata* Davis, in Minn. Bot. Studies, ii, 335 (1899).

Stems 2–7 dm. high, 3–5 mm. thick, almost simple to several-branched, subglabrous to sparsely pilose below, glandular-pubescent to -pilose above: basal leaves biternate to almost triternate, rather thin, green and glabrous to pubescent above, somewhat glaucous and glabrous to pubescent beneath; petioles up to 2 dm. long, mostly somewhat pilose; primary petiolules 1.5–5 cm. long, pilose, secondary shorter; leaflets broadly cuneate-obovate to wider, 1–4 cm. long, mostly cleft one-third to three-fourths their length, the divisions with shallow rounded lobes; cauline usually present at least above, the lower sometimes well developed, uppermost bracteate: flowers nodding, sparsely glandular-puberulent; sepals spreading to reflexed, generally yellow, elliptic-lanceolate to -oblong, 12–22 mm. long, 5–8 mm. wide, acute to subacuminate; laminæ cream-colored, 6–10 mm. long, broadly rounded; spurs yellowish, more or less incurved at apex, 6–18 mm. long, 3–4 mm. wide at base, gradually narrowed almost at once; stamens exceeding laminæ by 5–10 mm., anthers yellow, 1.5 mm. long; staminodia 6–8 mm. long, lanceolate, apiculate: follicles glandular-puberulent, 15–22 mm. long, often with tips spreading, styles 8–10 mm. long; seeds about 1.5 mm. long.

Type locality, Wasatch Mountains, Utah, the type collection *S. Watson 35*, May 1869. Ranging from British Columbia and Alberta to Oregon, Utah and Colorado. The tendency for spurs to curve, the long laminæ, and the short spurs are all indications of a relatively primitive species and would place *A. flavescens* as the lowest of the *formosa-canadensis* group. Representative collections may be cited as follows: British Columbia, *C. H. Shaw 1141, 282, J. M. Macoun 63471, S. Brown 309:* Alberta, *J. Macoun 64287, 95886, 95887, 95884, S. Brown 1116:* Washington, *J. W. Thompson 10551, 14931, 8454, 14890, 9267, T. S. Brandegee 614, A. D. E. Elmer 446;* Oregon, *W. C. & M. W. Muenscher 15803, W. C. Cusick 2450, 3217, C. V. Piper 2469;* Idaho, *MacDougal & Heller 840, J. B. Leiberg 1458, S. Watson 20, J. W. Thompson 13809, E. B. Payson 3580, 3488, Hitchcock & Martin 5774;* Montana, *P. A. Rydberg & E. A. Bessey 4068, 4066, Standley 15038, 15783, J. H. Flodman 452, 453, 454;* Wyoming, *E. A. Mearns 269, 3578, L. O. & R. P. Williams 3315, 3553, L. Williams 889:* Utah, *S. Watson 35, 36, M. E. Jones* July 1879, June 8, 1896 (type of *A. depauperata*), and July 23, 1895; Colorado, *W. C. Sturgis* July 19, 1902, *H. B. Meredith* June 17, 1895.

Subalpine plants are often reduced in stature and may be more hairy; such constitute the forma *minor* Tidestrom (Amer. Midland Nat. i, 171, 1910). *A. flavescens* apparently hybridizes with *A. brevistyla;* such a possibility may be *Macoun 95890* from Goat Mountain, Jasper Park, Alberta, with sepals spreading, blue, 16–20 mm. long; laminæ whitish or pale, 6–8 mm. long; spurs not hooked, 5–14 mm. long. *Macoun 95889* from the same place and on the same date is similar.

A. flavescens var. **miniana** Macbride & Payson, in Contr. Gray Herb. xlix, 61 (1917).

Sepals pink to salmon.

Type locality, Challis Creek, Custer County, Idaho. Occasional, British Columbia and Alberta to Idaho and Montana. Specimens may be cited as follows: British Columbia, *T. Ulke 1158, Hitchcock & Martin 7696, J. Macoun 64286;* Alberta, *J. M. Macoun 95885;* Montana, *J. E. Kirkwood 1787, Standley 15808;* Wyoming, *H. L. Bauer 67, T. G. Yuncker 5408;* Idaho, *Macbride & Payson 3751, 3692, 3326* (type), *3487, H. N. Moldenke 7199;* Washington, *J. W. Thompson 10551, 14890.*

This is not a well defined variety, but in some areas it supplants typical *A. flavescens* entirely. It has longer laminæ than *A. formosa* with which it is sometimes confused and to which it may well be related by hybridization or otherwise. Payson (Contr. U. S. Nat. Herb. xx, 143, 1918) says that where *A. flavescens* and *A. formosa* grow near together, the former is at higher elevations.

Aquilegia flavescens is not common in cultivation, but it is offered from time to time. Some plants so listed are purplish and obviously hybrid. I have seen garden material passing as "golden-spurred columbine" which belongs to *A. flavescens.* Rarely the name *A. flavescens* var. *albiflora* Hort. is met; I do not know whether it is properly applied.

52. **Aquilegia formosa** Fisch. in DC. Prodr. i, 50 (1824). Fig. 27.

A. canadensis var. *formosa* S. Wats. in Bot. King Expl. 10 (1871).

A. canadensis subsp. *formosa* Fisch. ex Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 319 (1893).

A. arctica Loud. Hort. Brit. 610 (1830), nomen; Planch. in Fl. des Serres, viii, t. 795 (plate, not text) (1852).

A. columbiana Rydb. in Bull. Torr. Bot. Club, xxix, 145 (1902).

A. Hookeri Borbás, Termés. Füzetek, viii, 311 (1884), based on Hooker, in Bot. Mag. t. 6552 (1881).

A. formosa subsp. *vera* Brühl, l. c.

A. formosa subsp. *vera* var. *arctica* Planch. ex Brühl, l. c.

27. AQUILEGIA FORMOSA, a widespread western species. At extreme upper right, petal of var. TRUNCATA.

A. canadensis subsp. *americana* var. *incarnata* Rapaics, in Bot. Közlem. viii, 136 (1909), in part.

A. emarginata Eastwood, in Leaflets W. Bot. ii, 7 (1937).

Stems mostly 5–10 dm. high, 2–4 mm. thick, glaucous, mostly glabrous below, openly branched and glandular-pubescent above: basal leaves biternate, rather thin, green and glabrous to pubescent above, glaucous and glabrous or more commonly pubescent beneath, the petioles mostly 1–2 dm. long, glabrous to pilose; primary petiolules 3–7 cm. long, secondary usually less than 1 cm.; leaflets cuneate-obovate to suborbicular or wider, mostly 2–4 cm. long, cleft to about the middle, then variously lobed with rounded or crenate teeth; lower cauline leaves well developed, uppermost 1–3-parted, lance-oblong, up to 2 or 3 cm. long: pedicels up to about 1 dm. long; flowers pendent, more or less pubescent; sepals red, ovate-lanceolate, wide-spreading to reflexed, mostly 15–25 mm. long, 5–10 mm. wide, acute to acuminate; laminæ yellow, rounded or truncate (even emarginate), 3–5 (6) mm. long; spurs red, rather stout, straight, 10–20 mm. long, about 5 mm. wide at base; stamens exceeding laminæ by 10–15 mm., anthers yellow, 1–1.5 mm. long; staminodia 6–8 mm. long, slightly crinkled, rather abruptly narrowed at tip, apiculate: follicles 5, glandular-pubescent, 15–25 mm. long, the styles 10–15 mm. long; seeds about 2 mm. long.

Type locality given as "In Kamchatka," but Komarov (Fl. U. R. S. S. vii, 98, 1937) puts *A. formosa* under "doubtful species" and says the citation from Kamchatka is in error and that the species is found only in northwest America. The range is from southern Alaska to northern California, Nevada, Utah and western Montana. Representative specimens of *A. formosa* are: Alaska, *J. D. Culbertson under Baker 4957, F. V. Coville & T. H. Kearney 1092, F. Funston 121, J. P. Anderson 451, Mr. & Mrs. E. P. Walker 724, 791, Ferd. Bischoff* in 1865–6; British Columbia, *Macoun 95877, 95878, 69385, H. M. Raup & E. C. Abbe 3787, 3809, Butters & Holway 239, S. Brown 288, 594, C. O. Rosendahl 2013, Rosendahl & Brand 23;* Alberta, *H. H. Smith 2912, S. Brown 1335;* Washington, *A. A. & E. G. Heller 3936* (type of *columbiana*), *J. W. Thompson 5372, 14710, W. C. & M. W. Muenscher 5404, Sandberg & Leiberg 385, A. D. E. Elmer 409, O. D. Allen 249, G. N. Jones 10358, J. S. Cotton 395;* Oregon, *A. Isabel Mulford* May 21, 1892, *L. Benson 2521, J. W. Thompson 4198, Hitchcock & Martin 4821, E. P. Sheldon 8466, J. B. Leiberg 536, 2550, Eastwood & Howell 1729* (type of *A. emarginata*), *Heller 13063;* Montana, *C. L. Shear 3128, P. A. Rydberg 2645:* Idaho, *A. Isabel Mulford* July 4, 1892, *J. B. Leiberg 1191, June Clark 86, Macbride & Payson 3084, J. W. Thompson 14073, J. F. Macbride 972:* Utah, *E. Palmer 7, E. H. Graham 10009, B. Maguire 2587, Maguire & Holmgren 21899;* Nevada, *S. Watson 34, Heller 10572, 9401, 11130, H. L. Mason 4782, Kennedy 1860, C. F. Baker 1205, I. Tidestrom 10176;* California, *Heller 12472, 11504, Eastwood 741, I. Tidestrom 3613, E. B. Copeland 362.*

The spreading sepals and biternate leaves of *A. formosa* put it near *A. flavescens*, with which occasional yellow-flowered plants might easily be confused, although that species has definitely longer laminæ. The intergradation with var. *truncata* is very gradual. Other variants are very minor ones (*wawawensis*, *pauciflora*, *hypolasia*) and not of the same importance.

Key to variants in *A. formosa:*

A. Spurs nearly or quite lacking.....e. f. *anomala*

AA. Spurs well developed.

B. Stems 1.5–3 dm. high, almost scape-like. High montane, California. .....c. var. *pauciflora*

BB. Stems 5–10 dm. high, freely branched.

C. Laminæ 3–6 mm. long.

D. Leaflets very thin, almost membranous: sepals and spurs pale red. Snake River Canyon, Garfield County, Washington .d. var. *wawawensis*

DD. Leaflets thicker: sepals and spurs brighter red. Alaska to Montana, Utah and northern California.....*A. formosa*

CC. Laminæ 1–2 mm. long.

D. Plant subglabrous or slightly hairy. Southern Oregon to central California, southward only in high mountains.....a. var. *truncata*

DD. Plant densely pubescent, almost viscid. Southern California below 6000 feet.....b. var. *hypolasia*

a. **A. formosa** var. **truncata** Baker, in Gard. Chron. ser. 2, x, 111 (1878); M. E. Jones, in Zoe, iv, 259 (1893).

A. truncata Fisch. & Mey. in Ind. Sem. Hort. Petrop. ix, Suppl. 8 (1843).

A. formosa subsp. *truncata* Payson, in Contr. U. S. Nat. Herb. xx, 143 (1918).

A. californica Hartw. ex Lindl. in Gard. Chron. page 836 (1854).

A. canadensis subsp. *americana* var. *incarnata* f. *truncata* Rapaics, in Bot. Közlem. viii, 136 (1909).

Stems glabrous or sparingly pubescent or pilose, 5–10 dm. high: leaflets 2–5 cm. long: sepals 10–20 mm. long; laminæ subtruncate, 1–2 mm. long: follicles 15–25 mm. long.

Type locality, Ft. Ross, California. Ranging from extreme southern Oregon to western Nevada and southern California. The bulk of the California material falls here; there is considerable variability. Representative of var. *truncata* may be cited: Oregon, *E. I. Applegate 2200, 3802, Coville & Applegate 15;* California, *Hartweg 1635, J. T. Howell 13388, Hitchcock & Martin 5386, C. L. Hitchcock 6485, J. P. Tracy 3222, 3337, L. Constance 2517, A. A. Heller & H. E. Brown 5274, Heller 6041, 6731, C. F. Baker 422, Heller & Kennedy 8847, J. G. Lemmon 20, M. E. Jones 2614, I. L. Wiggins 9499, Coville & Funston 1371, Munz* August 27, 1917, *6810a, L.*

R. Abrams & E. A. McGregor 659, Abrams 2714, J. Ewan 2744, I. W. Clokey 5256; Nevada, *C. L. Brown* July 25, 1907, *Hitchcock & Martin 5536, C. F. Baker 1205.*

† b. **A. formosa** var. **hypolasia** stat. nov.

A. hypolasia Greene, Leaflets Bot. Obs. ii, 141 (1911).

Stems 5–10 dm. high, viscid-pubescent: leaflets 2–5 cm. long: sepals 1.5–2 cm. long; laminæ 1–2 mm. long.

Type locality, between Campbell's and Cameron's ranches, eastern San Diego County, California. Ranging mostly below 7000 feet, from Los Angeles County, California, to northern Baja California; representative material is: California, *Munz 6810b, 5807, Ewan 7380, C. F. Baker 3673, Abrams 2733, 2757, S. B. & W. F. Parish 127, H. M. Hall 828, M. F. Spencer 2179, Collins & Kempton 201, F. F. Gander A197, E. A. Mearns 3657* (type); Baja California, *Wiggins & Demaree 4983.*

c. **A. formosa** var. **pauciflora** Boothman, in Gard. Chron. ser. 3, xcv, 281 (1934).

A. pauciflora Greene, Leaflets Bot. Obs. i, 76 (1904).

A. truncata var. *pauciflora* Jepson, Fl. Calif. i, 517 (1914).

A. formosa subsp. *pauciflora* Payson, in Contr. U. S. Nat. Herb. xx, 144 (1918).

Leaves mostly basal; stem scape-like, 1.5–3 dm. high: laminæ 2–3 mm. long.

Type locality, Hackett's Meadow, Sierra Nevada, Tulare County, California. A poorly defined entity from high elevations in the Sierra Nevada. Representative material is: California, *Eggleston 21543, C. F. Sonne* June 6, 1886, *Smiley 122, 473, Beryl O. Schreiber 1847, R. A. Ware 2736C, J. D. Culbertson under Baker 4460* (type), *E. Palmer 103, Johnston 1532;* Nevada, *J. R. Henricks 561.*

d. **A. formosa** var. **wawawensis** St. John, in Res. Studies State Coll. Wash. i, 97 (1929).

A. wawawensis Payson, in Contr. U. S. Nat. Herb. xx, 145, t. 10 (1918).

Leaflets very thin, almost membranous; bracts of upper stem foliose: sepals and spurs pale red, the latter very slender.

Known only from south bank, Snake River, opposite Truax, Whitman County, Washington, where it grows on moist cliffs in Garfield County. Specimens seen: *Rex Hunt 203* (type), *G. N. Jones & Rocelia Palmer 1134.*

e. **A. formosa f. anomala** J. T. Howell, in Leaflets W. Bot. ii, 255 (1940).

Laminæ about 5 mm. long; spurs nearly lacking.

Type, Siskiyou County, California, south fork of Salmon River near Big Flat, at 5000 feet, *Howell 13291* (not seen). Another collection of apparently the same thing is from Plumas County, California, *Mrs. R. M. Austin* in 1877.

Aquilegia formosa is offered by many nurserymen and seedsmen. It was listed as desirable as early as 1858 (Gard. Chron. 360) and the var. *truncata* was in cultivation in England as *A. californica* even earlier (Gard. Chron. 1854, page 836). In fact, the name *A. californica* still persists in the trade both in this country and abroad, although it was long since reduced to synonymy. Whether any of the *A. arctica* occasionally listed is the same as the old *arctica* Loud., a synonym of *A. formosa*, I have been unable in many cases to verify, although one such plant was much like *A. fragrans*. Some catalogues give their material of *A. arctica* as Alaskan in origin; it then almost certainly is true *A. formosa*.

Aquilegia formosa var. *hybrida* Hort. (*A. californica* var. *hybrida* Hort.) was originally produced by Douglas who crossed *A. californica* with *A. chrysantha* (see Floral Mag. t. 278, 1877). This hybrid, still common in the trade, has reddish sepals about 2.5 cm. long, red spurs about 3.5 cm. long, laminæ lemon-yellow; flowers erect; plants 7–8 dm. high (Journ. Roy. Hort. Soc. liii, 162, 1928). *A. superba* Hort. is said to be a synonym. Some of the Dobbie hybrids look as if they belong here. *A. formosa* var. *rubra-pleno* Hort. (var. *rubra flore-pleno* Hort.) has red double flowers and is occasionally listed, as is *A. formosa* var. *rosea flore-pleno* Hort. with rose double flowers. *A. formosa* var. *nana* Hort. has shell-pink flowers and var. *nana-alba* Hort. has them almost white. *A. truncata* var. *parvifolia* of a western firm sounds like *A. truncata* var. *pauciflora* or *A. formosa* var. *pauciflora* of this paper. It is also occasionally listed as *A. pauciflora*.

53. **Aquilegia Shockleyi** Eastwood, in Bull. Torr. Bot. Club, xxxii, 193 (1905). Fig. 28.

A. formosa subsp. *dissecta* Payson, in Contr. U. S. Nat. Herb. xx, 144 (1918).

A. formosa subsp. *cælifax* Payson, op. cit. t. 9.

A. formosa var. *cælifax* Munz, in Leaflets W. Bot. ii, 68 (1938).

A. mohavensis Munz, op. cit. 66, t. 1, fig. 1–3.

Stems 4–8 dm. high, 2–4 mm. thick near base, glabrous and glaucous through most of their length, mostly branched and glandular-pubescent in inflorescence: basal leaves usually triternate, not fleshy, pale green and

28. Aquilegia Shockleyi, a columbine from the desert-mountains of Nevada.

glabrous above, more glaucous and glabrous beneath, or somewhat pilose on both surfaces, more or less glutinous; petioles 5–20 cm. long, mostly glabrous; primary petiolules up to 9 cm. long, secondary up to about 2 cm. long, tertiary lacking or very short; leaflets cuneate-obovate to suborbicular, 5–30 mm. long, cleft to middle or deeper, the principal segments with 2–3 rounded or obtuse short lobes; lower cauline leaves well developed, the uppermost lance-linear or wider, 1–3 cm. long, 1–3-parted: pedicels 5–15 cm. long; flowers nodding, glandular-pubescent; sepals red or with some green or yellow, spreading to reflexed, lanceolate to elliptic, 10–20 mm. long, 4–8 mm. wide, acutish; laminæ yellow, rounded-truncate, 3–5 mm. long; spurs yellowish-red to red, 12–25 (30) mm. long, 4–6 mm. wide at base, nearly straight, gradually narrowed at about half their length to a rather narrow tip which is swollen at very apex; stamens exceeding laminæ by 10–16 mm., anthers yellow, about 1.5 mm. long; staminodia about 7 mm. long, scarcely crinkled, lanceolate, subacuminate: follicles glandular-puberulent, 17–25 mm. long, erect, the styles about 12 mm. long; seeds almost 2 mm. long.

Type locality, Soda Spring Canyon, Esmeralda County, Nevada. Growing about springs and in wet spots, southern Nevada and adjacent Mohave Desert of California. Representative collections of *A. Shockleyi* are: Utah, *Capt. Bishop* in 1872, *M. E. Jones 6047h;* Nevada, *W. H. Shockley 504* (type), *V. Duran 3091, S. Watson 33, P. Train 3779, F. W. Pennell & R. L. Schaeffer Jr. 23139, R. C Rollins & T. S. Chambers 2467, M. E. Jones* April 28, 1904 (type of *dissecta*), and September 5, 1912 (type of *cælifax*), *L. N. Goodding 947, A. A. Heller 11073, 11040, I. W. & C. B. Clokey & R. Bean 7093, I. W. Clokey 7926, 7515;* California, *Coville & Funston 1778, Coville & Gilman 86, Munz 14558, 14687* (type of *mohavensis*).

As here understood, the species is much more inclusive than heretofore treated. In Payson's revision of North American species (Contr. U. S. Nat. Herb. xx, 145, 1918) he restricted the name *Shockleyi* to the original collection and set up two new subspecies, *dissecta* and *cælifax*, under *A. formosa*, for other Nevada collections. Since then much more material has accumulated, especially the ample collections from the Charleston Mountains by I. W. Clokey. These show a range of variation as to length of spur and other characters, which seem to me to throw together the whole complex of plants from that desert region, having mostly triternate leaves, more glaucous than those of the *formosa-truncata* group, with leaflets smaller and perhaps more glutinous. One has to allow for considerable variation, but when he remembers that in so dry a region the distribution is very interrupted, with a few plants about one spring, then perhaps a space of a mile or two or many before the species is met again, such variation is not surprising. At present, then, it seems to me that we are dealing here with a natural entity having a very natural range, and as distinct from *A. formosa*

as are many of the species from each other. My *A. mohavensis*, with its small flowers, falls in with the others.

This species is not listed in the trade.

54. **Aquilegia eximia** Van Houtte ex Planch. in Fl. des Serres, ser. 2, ii, 15, t. 1188 (1857). Fig. 29.

A. Tracyi Jepson, Fl. W. Mid. Calif. Ed. 2, 165 (1911); Payson, in Contr. U. S. Nat. Herb. xx, 145, pl. 11 (1918).

A. fontinalis J. T. Howell, in Leaflets W. Bot. ii, 254 (1940).

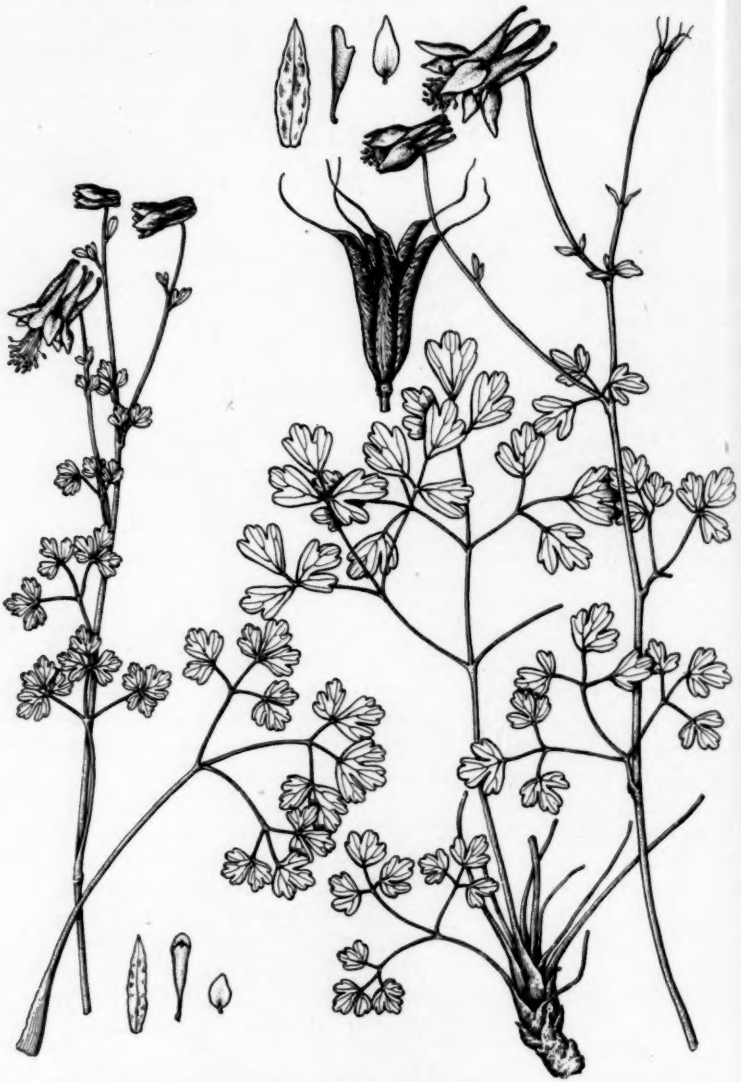
A. adiantoides Greene, Leaflets Bot. Obs. ii, 142 (1911).

Plant densely glandular-pubescent throughout; stems 5–10 dm. high, 2–4 mm. thick at base, freely branched above: basal leaves triternate, the petioles 1–2 dm. high, primary petiolules up to 7 or 8 cm., others shorter; leaflets broadly cuneate-obovate to suborbicular, 1–4 cm. long, greenish above, glaucous beneath, cleft to near the middle, the lobes with pointed rather than rounded teeth; cauline leaves few, the lower compound and petioled, the upper passing into lance-linear bracts 1–3-lobed and up to 5 cm. long: pedicels up to 1 dm. long; flowers nodding, viscid-puberulent; sepals spreading or reflexed, reddish, ovate-lanceolate, mostly 15–25 mm. long, 5–10 mm. wide, subacuminate; laminæ lacking, the spurs scarlet below, yellowish toward orifice, 18–30 mm. long, 8–10 mm. wide at the orifice and sloping backward, somewhat incurved, abruptly contracted toward the apex; stamens 1.5–2.5 cm. long, anthers yellow, about 1.5 mm. long; staminodia 8–11 mm. long, lanceolate, plane, short-apiculate: follicles glandular-pubescent, 15–25 mm. long, erect, the styles 15–20 mm. long, pubescent at base; seeds almost 2 mm. long.

Type locality not given. Growing in canyons of Coast Ranges, Mendocino County to San Luis Obispo County, California. Representative specimens are: *V. K. Chestnut 392, C. Purdy* August 1882, *J. Torrey 7, Heller 6014, Abrams 6268, J. T. Howell 11636, Eastwood* August 1900 and July 10, 1913, *A. D. E. Elmer 4952, 4271, 4008, Inez Ray Smith* July 27, 1912, *H. K. Sharsmith 1215, W. H. Brewer 797* (type of *adiantoides*), *773, E. Palmer 9, Eastwood & Howell 5934* (type collection of *fontinalis*).

The species is distinct in its vesture, triternate leaves with pointed teeth, very coarse spurs and lack of laminæ. The laminæ alone are not enough to separate it always from *A. formosa* var. *truncata*, nor is any other single character. Yet the whole complex seems adequate for specific rank. On the whole, *A. eximia* tends to flower later than *A. formosa* var. *truncata*. Out of the normal range is *Elmer 4008* from Ventura County, yet it certainly belongs here although with smaller more congested leaves and smaller flowers. *Hasse* from San Jacinto Mountains, Riverside County, California, June 30, 1892, seems near *A. eximia;* the species may at one time (like so many California species) have ranged farther south than it now does.

29. AQUILEGIA EXIMIA, a species notable for lack of laminæ. The figure of the separate petal is reversed from the position in other illustrations, the base of the petal being away from the reader.



30. Aquilegia desertorum at the left. Aquilegia triternata at the right.

The name *Aquilegia eximia* is occasionally given in nursery catalogues. The garden plants I have seen bearing this name have long laminæ and spurs and seem to be hybrids of *A. formosa* and *A. chrysantha*. The species first flowered in 1856 in Europe and was described in 1857. Its distinctness from *A. formosa* (*A. californica*) was at once questioned (Gard. Chron. 326, 1857) and the two have frequently been confused since.

55. **Aquilegia desertorum** Cockerell ex Heller, in Muhlenbergia, i, 27 (1901); Payson, in Contr. U. S. Nat. Herb. xx, 148 (1918). Fig. 30.

A. formosa var. *desertorum* M. E. Jones, Contr. W. Bot. viii, 2 (1898).

Stems 1.5–3.5 dm. high, 1–2.5 mm. thick, glaucous and more or less glandular-pubescent (especially above), mostly open-branched: basal leaves biternate to almost triternate, somewhat glaucous and glabrous above, more glaucous and pilose beneath; petioles 5–10 cm. long, very slender, somewhat pubescent, primary petiolules up to 3 cm. long, pilose, secondary shorter; leaflets cuneate-obovate, thickish in texture, mostly 10–15 mm. long, 2–3-cleft to near the base, then 2–3-toothed; cauline leaves several, the uppermost bracteate, 1–3-lobed, 2–8 mm. long: pedicels up to about 1 dm. long; flowers nodding, glandular-pubescent; sepals divergent, elliptic-lanceolate, red, 8–10 mm. long; laminæ yellow, rounded-truncate, 4–5 mm. long; spurs red, straight, 15–22 mm. long, about 4 mm. wide at base, rather abruptly narrowed at about two-thirds their length into slender tubular portion; stamens exceeding laminæ by about 1 cm., anthers yellow, barely 1 mm. long; staminodia about 6 mm. long, linear-lanceolate: follicles 1.5–2 cm. long, glandular-pubescent, the styles about 8 mm. long.

Type locality, Flagstaff, Arizona. A rare species, known from altitudes of 7000–8000 feet, northern Navajo and Coconino counties, Arizona. Specimens seen of *A. desertorum: M. E. Jones* August 29, 1884 (type), *E. A. Mearns* June 1, 1887, *D. T. MacDougal 327*.

This species has the small leaflets of *A. triternata* but the leaves are more biternate and sepals shorter. It resembles *A. Shockleyi* in foliage. The plants from near Santa Fe, New Mexico, which Cockerell had in mind when he first used the name *A. desertorum* were actually *A. elegantula* and his reference (Bot. Gaz. lxii, 413, 1916) to a cross between *A. desertorum* and *A. chrysantha* actually applied to one involving *A. elegantula*. However, the Heller reference in Muhlenbergia was to true *A. desertorum*.

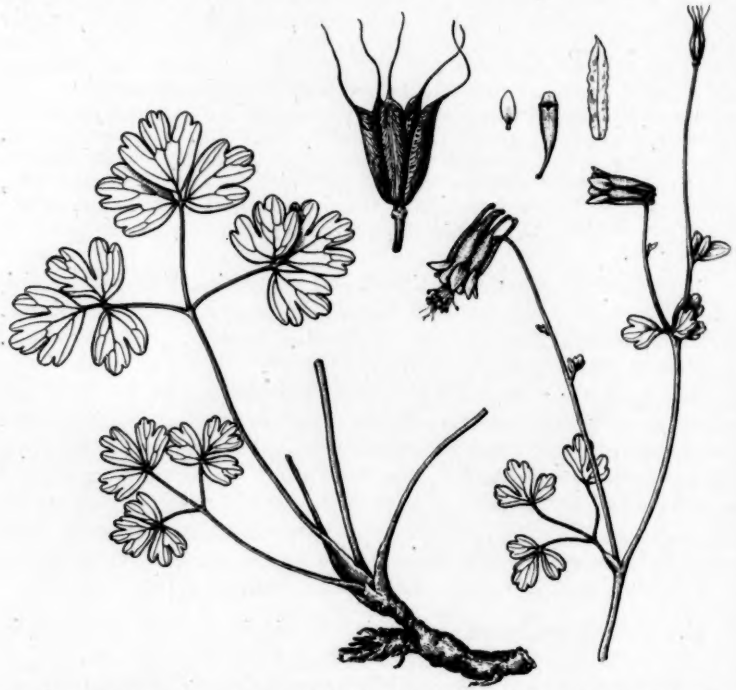
I have not seen this species listed in the trade.

56. **Aquilegia elegantula** Greene, in Pittonia, iv, 14 (1899); Payson, in Contr. U. S. Nat. Herb. xx, 149, t. 12 (1918). Fig. 31.

A. desertorum Cockerell, in Muhlenbergia, i, 27 (1901), as to plants from New Mexico only.

Probably *A. canadensis* subsp. *typica* var. *Fendleri* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 320 (1893), since the only Fendler collection I have seen belongs here.

Stems 1–3 (4) dm. high, 1.5–3 mm. thick and glabrous or slightly pilose below, subglabrous to somewhat glandular-pilose above, 1–few-flowered: basal leaves biternate, green and glabrous above, glaucous and glabrous to pilose beneath, the petioles up to 1.5 (2) dm. long, mostly glabrous; petiolules up to 4 (7) cm. long, more or less pilose; leaflets sessile or on short secondary petiolules, cuneate-obovate, 1–2.5 (4) cm. long, about as wide, rather thin, 2–3-cleft to about the middle, then each division with 2–3 shallow rounded lobes; stem-leaves in upper parts of stem, 1 at base of each branch, the lower petioled, the uppermost becoming sessile 1–3-lobed bracts: pedicels up to 5 (10) cm. long; flowers pendent, subcylindric, glabrous to puberulent; sepals red, usually greenish or yellowish toward tip, erect, elliptic-ovate, 7–11 mm. long, 4–5 mm. wide, acute; laminæ yellow, 6–8 mm. long, somewhat rounded at apex; spurs red, straight, 16–20 mm. long, 3–5 mm. wide at base, abruptly narrowed about



31. AQUILEGIA ELEGANTULA, a small columbine of the southern Rocky Mountains.

two-thirds way from base into very slender tube with swollen tip; stamens exceeding laminæ by 4–6 mm., anthers yellow, about 1 mm. long; staminodia broadly lanceolate, 6–7 mm. long, somewhat crinkled on margin, acuminate: follicles 5, glandular-pubescent, 13–20 mm. long, erect or spreading at tips, the styles almost glabrous, 13–15 mm. long; seeds about 1.5 mm. long.

Type locality, Slide Rock Canyon, near Mancos, Colorado. Ranging at elevations of 8000–11,000 feet, southeastern Utah and southwestern Colorado through most of New Mexico, rare in northern Mexico, although eventually more material may warrant the separation of the Mexican plants from the more northern ones. Of the various western species this seems nearest to the eastern *A. canadensis*, but is separable by the relatively shorter sepals with a greenish tinge, a condition approached by *A. canadensis* var. *latiuscula*. Representative specimens are: Colorado, *I. Tidestrom 1542, E. Payson 472, I. W. Clokey 2686, C. F. Baker 211, W. W. Eggleston 5687, E. Bethel, F. S. Willey & I. W. Clokey 4120, C. S. Crandall 7, Baker, Earle & Tracy 237* (type), *R. C. Rollins 1291;* Utah, *G. J. Goodman & C. L. Hitchcock 1463;* Arizona, *G. J. Goodman & Lois Butler Payson 2867;* New Mexico, *Susan D. McKelvey 2401, A. Fendler 9, A. A. & E. G. Heller 3691, P. C. Standley 4031, W. W. Eggleston 18785, G. L. Fisher 38209, H. Wilkens 2407;* Mexico, *E. A. Phillips 644, Mexican Biological Expedition from University of Illinois 924.*

Aquilegia elegantula is offered by a number of western firms which probably have the plant correctly named, since it is fairly common in their region.

57. **Aquilegia triternata** Payson, in Contr. U. S. Nat. Herb. xx, 147, t. 8 (1918). Fig. 30.

Stems 2–6 dm. high, 1–3 mm. thick below, usually rather densely glandular-pilose or -pubescent throughout, sometimes in upper parts only, tending to be openly several-branched: basal leaves usually triternate, greenish and glabrous to pilose above, glaucous and glabrous or usually pilose beneath but not viscid; petioles slender, mostly 5–15 cm. long, pilose; primary petiolules subfiliform, pilose, mostly 2–5 cm. long, the secondary often about half as long; leaflets cuneate-obovate to suborbicular, mostly 5–20, sometimes 35 mm. long, 2–3-cleft one-third or more of their length, the main divisions with 1–3 rounded teeth or lobes; cauline leaves several, gradually reduced upward, the uppermost linear-lanceolate and simple, 5–10 mm. long, or with 3 broader lobes: pedicels up to 1 dm. long; flowers nodding, more or less pubescent; sepals divaricate, light red, ovate-lanceolate, 12–20 mm. long, sharply acute to subacuminate; laminæ yellowish to somewhat red, 7–8 mm. long, rounded-truncate; spurs light red, 18–22 mm. long, 4–5 mm. wide at base, more or less pubescent, narrowed abruptly at about two-thirds their length into very slender tubes with apical thickening; stamens exceeding the laminæ by as much as

1 cm., anthers yellow, about 1 mm. long; staminodia linear-lanceolate, 8–9 mm. long, somewhat crinkled on margins: follicles glandular-pilose, 15–30 mm. long, erect or with spreading tips; styles pubescent below, 10–12 mm. long; seeds almost 2 mm. long.

Type locality, Outlaw Canyon, Chiricahua Mountains, Cochise County, Arizona. Ranging at elevations of 6000–10,000 feet, Arizona and adjacent New Mexico, rare in western Colorado. Illustrative of the species may be cited the following collections: Arizona, *D. T. MacDougal 134, Mrs. Rose E. Collom 234, L. N. Goodding 1123, 607, 2325, J. T. Rothrock 268, J. C. Blumer 206, 1441, 1475.*

Aquilegia triternata differs from *A. elegantula* by the triternate tendency and redder longer more divergent sepals, from *A. desertorum* by triternate tendency, greener leaves and longer sepals. While there is considerable variation, it is not definitely geographic. Some plants from the Huachuca, Rincon and White Mountains of Arizona have rather large leaflets, but those from the Sandia Mountains of New Mexico have still larger. Most New Mexican material has rather short sepals; *Blumer 3591* from Pima County, Arizona, has spurs up to 3.5 cm. long. Since the variations are so spotted in distribution, I am not recognizing any taxonomic varieties.

The name *triternata* does not appear in the trade.

58. **Aquilegia canadensis** Linn. Sp. Pl. 533 (1753). Fig. 32.

A. canadensis subsp. *canadensis* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 319 (1893).

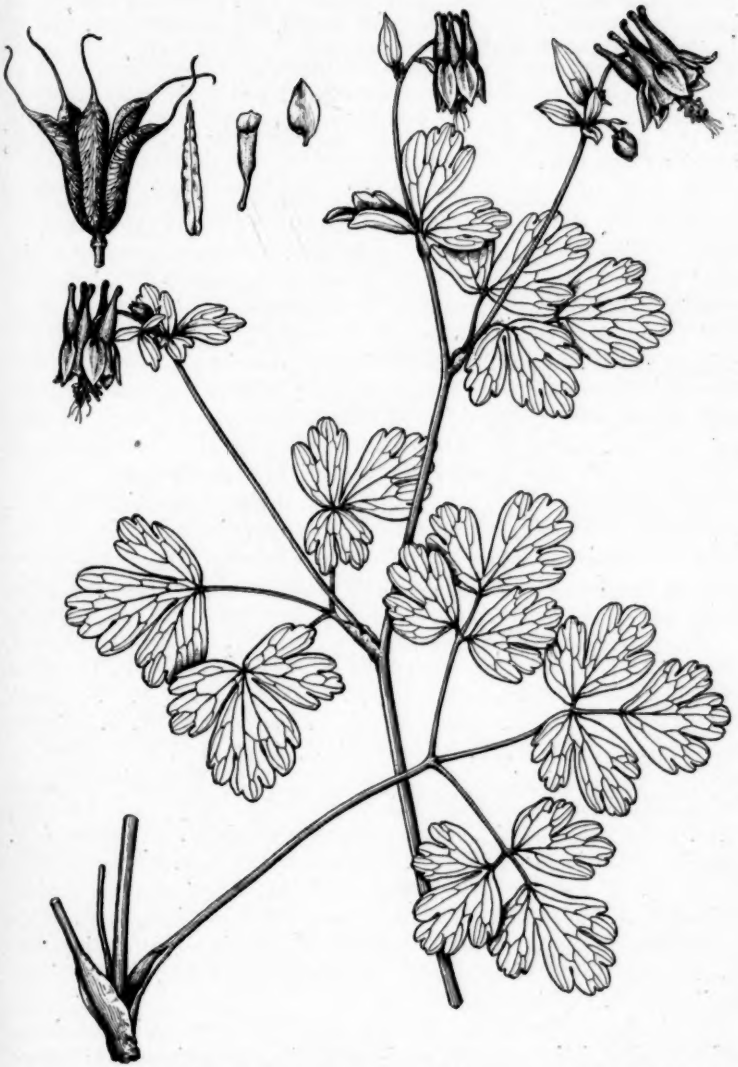
A. variegata Moench, Meth. 311 (1794).

A. elegans Salisb. Prodr. 374 (1796).

A. canadensis subsp. *typica* var. *vera* Brühl, op. cit. 320.

A. canadensis subsp. *americana* Rapaics, in Bot. Közlem. viii, 136 (1909).

Stems mostly 1.5–4 dm. high, sometimes up to 6 or 7 dm., usually with open branching above, 1.5–4 mm. thick near base, usually somewhat pilose below, more densely so above with some hairs gland-tipped, sometimes densely glandular: basal leaves mostly biternate, not fleshy, light green and glabrous above, more or less glaucous and from almost glabrous to rather densely pilose beneath; petioles 5–12 (20) cm. long, more or less pilose and glandular; primary petiolules 2–3 (5) cm. long, glandular and pilose, secondary up to 1 cm. long; leaflets cuneate-obovate, 1–2 (4) cm. long, 2–3-cleft about one-third to one-half way, the divisions mostly 5–15 mm. wide and with 2–3 shallow rounded lobes; cauline leaves usually well developed, 2 or more petioled, giving way to 3-lobed or entire bracts: flowers usually several, pendent, glandular-pubescent without, the pedicels up to 5 (10) cm. long; sepals red, somewhat divergent, lance-ovate to ovate, 10–14 mm. long, 6–8 mm. wide, usually subacuminate; laminæ yellow, 6–8 mm. long, almost as wide, rounded-truncate and usually apiculate;



32. AQUILEGIA CANADENSIS, showing the biternate leaves and ovate sepals of the typical form.

spurs red, straight, 2–2.5 cm. long, about 5 mm. wide near base, rather abruptly narrowed at about half their length, then about 1 mm. wide up to the somewhat swollen tip; stamens exserted about 1 cm., anthers yellow, about 0.5 mm. long; staminodia lance-linear, slightly crinkled on margin, about 8 mm. long, gradually attenuate into sharp apex: follicles 5, glandular-pubescent, 15–22 (30) mm. long, usually spreading at apex, the styles 10–20 mm. long, pubescent in lower part; seeds shining black, about 1.5 mm. long.

Type locality, "Habitat in Virginia, Canada." Ranging from Nova Scotia to Ontario, south along the Atlantic coast to Georgia; occasional from Michigan and Wisconsin to Tennessee. Naturally, when we divide what has commonly passed as *A. canadensis* into several varieties, the question arises as to which of these is the true *canadensis*. It would be expected that plants from near the Atlantic seaboard would have been available to Linnæus rather than something from the interior. Checking over the references cited by Linnæus and study of the Arnold Arboretum's photograph of the specimen in the Linnean Herbarium confirm the present use of *A. canadensis*. Most of the plates referred to by Linnæus are not very clearly drawn, but seem to have ovate sepals rather than the oblong-ovate ones of var. *coccinea*. Jackson (Index to the Linnean Herb. 36, 1912) says that the specimen above referred to is labelled in Linnæus' hand and was in the herbarium before 1753. It is the type. It has flowers about 3 cm. high, sepals 1 cm. long, spurs slender. There is no indication as to its origin, but it may have come from Canada, possibly sent by Kalm.

Representative of *A. canadensis* are: Quebec, *J. Macoun 66, 652, Senn & Hart 1387;* Maine, *Fernald & Long 13670:* Vermont, *J. M. Greenman 215, Moldenke 9575:* Massachusetts, *E. J. Palmer 36376, F. C. Seymour 1941:* New York, *O. P. Phelps 474, A. J. Eames 8136, M. C. Wiegand 2335;* Pennsylvania, *W. M. Benner 3511, A. A. & E. G. Heller* April 25, 1891; Maryland, *Tidestrom 4740, Wherry & Adams 2542;* Virginia, *Pennell 12110, Miss E. S. Rawlinson 33, E. Jerome Grimes 2550:* North Carolina, *D. S. Correll 10863, C. A. Weatherby 6093:* Georgia, *J. H. Miller & B. Maguire 598;* West Virginia, *C. F. Millspaugh 1534, L. F. Ward 126;* Kentucky, *W. A. Anderson 433, Smith, Hodgdon, Gilbert & McCoy 3480:* Tennessee, *E. B. Harger 7801, E. J Palmer 35444;* Michigan, *J. H. Ehlers 419;* Wisconsin, *Greenman 2191, Fassett 14791;* Illinois, *O. E. Lansing 4075, A. S. Pease 13438:* Indiana, *Deam 15900, 23105, 23478:* Ohio, *E. Wilkinson* April 1897, *A. E. Ricksecker* May 1895.

Aquilegia canadensis has fairly well marked geographical variants, which I call varieties *australis, coccinea, hybrida,* and *latiuscula*. But there is abundant intergradation and many specimens are difficult to place. In addition to these are color forms: yellow, salmon, and white. They too have been given names and since they are largely modifications of *A.*

canadensis proper, they are herewith presented before the real varieties are keyed and discussed:

(1) **A. canadensis** f. **flaviflora** Britton ex House, in N. Y. State Mus. Bull. 254, page 335 (1924).

A. flaviflora Tenney, in Amer. Nat. i, 388 (1868).

A. canadensis var. *flaviflora* Britton, in Bull. Torr. Bot. Club, xv, 97 (1888).

Probably *A. canadensis* var. *aurea* Orpet, in Gard. & For. ii, 258 (1889), not Roezl 1872.

Flowers yellow.

Type locality, high ground west of the Hudson, opposite Poughkeepsie, New York. Specimens seen: *Cult. Hort. Parkman* in 1878; Massachusetts, *G. D. Phippen* in 1888, *Hitchins* in 1883; Connecticut, *R. W. Woodward* June 6, 1907; New York, *Tenney* in 1866, *W. M. Beauchamp* May 31, 1895; New Jersey, *N. L. Britton* May 24, 1885; Pennsylvania, *J. H. Eby* May 18, 1889.

† (2) **A. canadensis** f. **Phippenii,** stat. nov.

A. canadensis var. *Phippenii* J. Robinson, in Bull. Torr. Bot. Club, xv, 166 (1888).

Flowers salmon.

Type locality, Salem, Massachusetts. Specimens seen: Maine, *Fernald 2220;* Massachusetts, *E. W. Bennis* in 1928.

(3) **A. canadensis** f. **albiflora** House, in N. Y. State Mus. Bull. 243–244, page 48 (1923).

Flowers white.

Reported from near Syracuse, New York.

A double-flowered *A. canadensis* was collected by J. D. Bearss at Tomah, Wisconsin, June 1882 and is in the Gray Herbarium. Plants with spurless flowers have been found at Boylston, Massachusetts, by school children, May 14, 1913, and at St. Johnsbury, Vermont, May 20, 1896, *Francis P. Perry.*

Key to varieties of *A. canadensis:*

A. Sepals 15–20 mm. long, oblong-ovate: plant 3–8 dm. high, robust: leaflets 2–4 cm. long, their main divisions 8–15 mm. wide: spurs stout. Alleghany Mountains to Arkansas, Iowa, Minnesota.....a. var. *coccinea*

AA. Sepals 10–14 mm. long.

B. Stems mostly 1.5–4 dm. high: leaflets 1–2 (4) cm. long: spurs slender.

C. Basal leaves biternate, the leaflets cleft one-third to one-half their length: follicles often spreading near tips. Widely spread east of Mississippi River.....*A. canadensis*

CC. Basal leaves often triternate, the leaflets cleft more than half their length: follicles erect. Nebraska to Texas.....d. var. *latiuscula*

BB. Stems mostly 4–8 dm. high: leaflets 2–5 cm. long: spurs stout.
c. Basal leaves biternate: sepals mostly 5–7 mm. wide: follicles erect: spurs 12–20 mm. long. Manitoba to Minnesota and Nebraska. ..... b. var. *hybrida*
cc. Basal leaves often triternate: sepals mostly 3–4 mm. wide: follicles with spreading tips: spurs 20–24 mm. long. Florida..... c. var. *australis*

† a. **A. canadensis** var. **coccinea** stat. nov.

A. coccinea Small, in Bull. N. Y. Bot. Gard. i, 280 (1899).

Stems 3–8 dm. high, subglabrous below and glandular-pubescent or glandular-pilose above or almost throughout: leaves biternate, green and glabrous above, glaucous and glabrous to somewhat pilose beneath, the leaflets mostly rounded-obovate in outline, 2–3 (4) cm. long, cleft to near or below the middle, the main divisions mostly 8–15 mm. wide: sepals narrowly oblong-ovate, 15–20 mm. long, acute to subacuminate; laminæ about 7 mm. long; spurs coarse, 20–24 mm. long: follicles 15–25 mm. long, erect.

Type locality, banks of the Roanoke, Virginia, if one takes the first specimen cited in the original description, a collection made on May 29, 1890, by *Brown, Hogg, Vail, et al.* Ranging from mountains of Maryland and Virginia southward to South Carolina, then west to Arkansas, Missouri, Iowa and Minnesota and north to Ontario. Occasional specimens from New England to New York and Delaware have sepals and sometimes the stature of this variety, and represent intergrades of *canadensis* and *coccinea*, for example: New Hampshire, *E. F. Williams* May 30, 1899; Connecticut, *G. H. Bartlett* June 3, 1906; New York, *S. H. Burnham* May 21, 1910, *F. V. Coville* June 21, 1883, *J. R. Churchill* June 4, 1893; New Jersey, *L. M. Stabler* May 25, 1885, *C. D. Lippincott* May 15, 1892; Delaware, *R. R. Tatnall 3263:* Pennsylvania, *J. Kosinski* May 24, 1942.

As representative of var. *coccinea* may be cited: Maryland, *E. L. Morris 1409, J. M. Fogg Jr. 1892:* West Virginia, *Rydberg 9042;* Virginia, *Camp 1287, 2129, Mrs. E. S. Steele 30;* North Carolina, *H. D. House 4309;* South Carolina, *House 3174, 3086:* Indiana, *L. M. Umbach 5278, T. C. Davis & C. C. Thomas* in 1913, *H. Walton Clark 1667:* Ohio, *H. A. Gleason* May 13, 1905; Kentucky, *C. W. Short* in 1840, *J. W. Senger 68:* Tennessee, *A. Ruth 201, 202;* Alabama, *C. Mohr* June 6, 1892, *H. E. Wheeler* April 27, 1940; Ontario, *J. Fowler* June 8, 1906 and June 8, 1895, *J. Macoun 33563;* Minnesota, *Olga Lakela 2457, C. O. Rosendahl 357:* Wisconsin, *O. E. Lansing Jr. 3406;* Michigan, *R. R. Dreisbach 4746, 5807;* Illinois, *L. M. Umbach 111, Greenman, Lansing & Dixon 36, V. H. Chase 1372:* Iowa, *C. R. Ball & E. G. Preston 466, G. J. Goodwin 2983, E. J. Palmer 35854:* Kansas, *E. J. Palmer 21220;* Missouri, *E. J. Palmer 41331, 35722;* Arkansas, *G. W. Letterman* May 1884.

	Height in dm.	Leaves	Leaflets in cm.	Sepals shape	Sepals size in cm.	Laminæ in cm.	Spurs in cm.	Follicles in cm.	Range
canadensis	1.5–4	biternate	1–2(4) x 0.5–1.5	ovate to lance-ovate	1–1.4 x 0.6–0.8	0.6–0.8	2–2.5 slender	1.5–2.2 spreading	Nova Scotia to Georgia; Ontario to Tennessee
coccinea	3–8	biternate	2–3(4) x 0.8–1.5	oblong-ovate	1.5–2 x 0.6–0.7	0.7	2–2.4 stout	1.5–2.5 erect	Maryland to South Carolina; Ontario to Arkansas and Iowa
latiuscula	2–5	triternate	1–3 x 0.3–1	lance-ovate	1–1.4 x 0.6–0.7	0.5–0.6	1.8–2.2 slender	1.5–2 erect	Nebraska to Texas
hybrida	4–9	biternate	2–5 x 0.7–2.5	lance-ovate	1.1–1.4 x 0.5–0.7	0.6–0.7	1.2–2 coarse	1.6–2.6 erect	Manitoba to Nebraska
australis	4–8	triternate	1.5–3 x 0.3–1	lance-oblong	1.1–1.3 x 0.3–0.4	0.6	2–2.4 coarse	1.5–2 spreading	Florida

TABLE 1. General characters of the varieties of *Aquilegia canadensis*.

b. **A. canadensis** var. **hybrida** Hook. Fl. Bor.-Amer. i, 24 (1829).

A. eminens Greene, in Fedde, Repert. xiii, 321 (1914).

Stems 4–9 or more dm. high, subglabrous except for short gland-tipped hairs near summit: leaves biternate; leaflets mostly 2–5 cm. long, green and glabrous above, glaucous and somewhat pubescent beneath, cleft to above middle, the main divisions 7–25 mm. wide: sepals ovate-lanceolate, 11–14 mm. long; laminæ 6–7 mm. long; spurs coarse, 12–20 mm. long: follicles 16–26 mm. long, quite erect.

Type locality, "Among the Rocky Mts. bet. lat. 52° and 55°, Drummond." The var. *hybrida* ranges from Manitoba and Minnesota to northern Nebraska. Dried flowers often have purplish-red sepals, suggesting influence of *A. brevistyla*. Specimens representative of the variety are: Manitoba, *J. Macoun & W. Herriot 69777, 67776;* Michigan, *Fernald & Pease 3313, 3314:* Minnesota, *E. A. Mearns* May 23, 1891 (type of *eminens*), *P. Johnson 397;* North Dakota, *J. Lunell* June 16, 1910, *J. T. Sarvis 54;* South Dakota, *E. J. Palmer 37028, Rydberg 502, 501:* Iowa, *G. J. Goodman 3280:* Nebraska, *F. Clements 2535, W. Muenscher 3175.*

A form with yellow flowers from west of Rapid City, South Dakota, *A. C. McIntosh 201* and Rapid Creek Canyon, *H. E. Hayward 807*, has received the herbarium name *A. tenebrosa* A. Nelson which was listed but not described by Hayward in Botanical Gazette, lxxxv, 382, 1928.

The variety *hybrida* intergrades with geographically adjacent varieties: (1) with typical *canadensis*, Wisconsin, *W. Rhoades* July 1927, Ontario, *Breed, Jeffrey, Jenkins et al. 114, Fernald & Pease 3312, L. H. Dewey 76*: (2) with var. *coccinea*, Minnesota, *A. S. Pease & R. C. Bean 26250.*

† c. **A. canadensis** var. **australis** stat. nov.

A. australis Small, in Bull. Torr. Bot. Club, xxv, 466 (1898).

Stems 4–8 dm. high, scattered-pilose below, densely so in inflorescence, with gland-tipped hairs: leaves pale green, glabrous above, white-glaucous and somewhat pilose beneath, often triternate; leaflets 1.5–3 cm. long, 2–3-cleft to above middle, the main divisions 3–10 mm. wide: sepals oblong-lanceolate, 11–13 mm. long, 3–4 (5) mm. wide, subacuminate; laminæ about 6 mm. long; spurs 20–24 mm. long, rather coarse, narrowed about 10–12 mm. above the tips: follicles 15–20 mm. long, spreading at tips.

Type locality, Marianna, Walton County, Florida. Known only from limestone ledges and cliffs in northwestern Florida. Examples are: *R M. Harper 5* and *54, A. H. Curtiss* in 1885, *Small & Wherry 11679, E. J. Palmer 38587.*

† d. **A. canadensis** var. **latiuscula** stat. nov.

A. latiuscula Greene, in Fedde, Repert. xiii, 320 (1914).

A. phœnicantha Cory, in Rhodora, xxxviii, 75 (1936).

A. canadensis β violacea Nutt. ex Torr. & Gray, Fl. N. Amer. i, 29 (1838), pro syn.

Stems mostly 2–5 dm. high, highly branched, rather sparsely pilose throughout to almost glabrous, slightly glandular: leaf-blades sometimes triternate, bright green and glabrous above, glaucous and somewhat pilose beneath; leaflets 1–3 cm. long, usually cleft to below the middle and the main divisions 3–10 (15) mm. wide: sepals ovate-lanceolate, sometimes greenish, 10–13 (14) mm. long, acute; laminæ 5–6 mm. long, round-truncate; spurs 18–22 mm. long, slender, narrowed rather gradually at half their length: follicles 15–20 mm. long, not usually flaring much at tips.

Type locality, rocky woods, Riley County, Kansas. Ranging from Nebraska and Missouri to Texas. Examples representative of the variety are: Nebraska, *Nuttall* (type of *violacea*), *W. Muenscher 3187;* Kansas, *J. B. Norton 7* (type); Missouri, *B. F. Bush 7983, 10468, E. J. Palmer 29974;* Oklahoma, *M. Hopkins 3217, G. W. Stevens 2009;* Arkansas, *D. Demaree 21305, 17678;* Texas, *E. R. Bogusch 597, E. J. Palmer 9288, H. B. Parks 29490, V. L. Cory 8504* (type of *phœnicantha*). Intergrades with var. *coccinea* are: Iowa, *Ada Hayden 2090;* Missouri, *B. F. Bush 4946.*

The name *Aquilegia canadensis* is common in the trade, and much of the material so offered is typical of the species, although some has the sepals too widely spreading and approaches *A. formosa.*

The var. *nana* Hort. is supposed to grow to a height of about 30 cm. An old name which I have not been able to check is var. *gracilis* Hort. (see Morris, Fl. Conspic. t. 55, 1825–30) which has a very slender form.

In 1926 in Gardeners' Chronicle (ser. 3, lxxx, 417) Isabella Preston described some new hybrids produced at the Central Experimental Farm at Ottawa, between *A. canadensis* and *A. oxysepala* and which were being called "canadensis hybrids." The hybrids were red-purple, their offspring had great variety and were early bloomers. She said that hybrids between *A. canadensis* and "*A. flabellata nana alba*" had uninteresting small purplish flowers.

Seed offered by a South Dakota firm under the name *A. latiuscula* and said to produce plants 6 dm. high are probably *A. canadensis* var. *hybrida.* Professor Anderson writes me that first generation hybrids between *A. vulgaris* and *A. canadensis* usually have great hybrid vigor. They become very common in botanical gardens and other places where collections of the genus are being grown.

59. **Aquilegia Skinneri** Hook. in Bot. Mag. t. 3919 (1842). Fig. 33.

A. Schinneri Poit. in Rev. Hort. ser. 2, iv, 185 (1845–6), sphalm.

A. mexicana Hook. l. c., pro. syn.

A. madrensis Rose, in Contr. U. S. Nat. Herb. xii, 265 (1909).

A. canadensis subsp. *Skinneri* Hook. ex Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 319 (1893).

Stems 6–10 dm. high, 4–5 mm. thick, glaucous, nearly or quite glabrous below, glandular-pilose in upper parts, usually open-branched: basal leaves triternate, thin, greenish and glabrous above, somewhat pilose and glaucous beneath; petioles commonly 1–2 dm. long, subglabrous or somewhat pilose; primary petiolules very slender, 2–6 cm. long, somewhat pilose, the secondary up to 4 cm. long, tertiary up to 1.5 cm. long; leaflets cuneate-obovate to suborbicular, 1.5–4.5 cm. long, cleft to about the middle, each division usually with 2–3 rounded lobes; lower cauline leaves well developed, the uppermost subulate to lanceolate, simple, 5–15 mm. long: pedicels up to 1.5 dm. long; flowers pendent, puberulent; sepals erect to divaricate, yellowish-green, ovate-lanceolate to lanceolate, acuminate, 18–28 mm. long, 6–10 mm. wide; laminæ greenish, rounded-truncate, 8–10 mm. long; spurs red, straight, 3.5–5 cm. long, 7–8 mm. wide at base, rather abruptly narrowed at about half their length or more gradually so; stamens exceeding laminæ by 12–20 mm., anthers yellow, about 2 mm. long; staminodia about 1 cm. long, crinkled on margin, abruptly narrowed and apiculate: follicles 2–3 cm. long, suberect, glandular-pubescent, the styles about 2 cm. long; seeds almost 2 mm. long.

Type locality given originally as Guatemala, but the plant is known from northern Mexico only. It is an amply distinct species in its greenish sepals and laminæ, large flowers, and triternate leaves. Representative specimens are: Chihuahua, *E. Palmer 336*, *C. G. Pringle 1182*, *LeSueur 632*, *H. S. Gentry 2586*, *M. E. Jones* September 26, 1903, *C. H. T. Townsend & C. M. Barber 78;* Durango, *E. W. Nelson 4762;* Jalisco, *J. N. Rose 2954* (type of *madrensis*).

The name *A. Skinneri* is common in the trade and much of the material offered is true to name. Some plants have the sepals more widely spreading than do those in the wild. A type with a double row of petals is known as var. *flore-pleno* Hort. which was mentioned as early as 1884 (Jahrb. f. Gartenkunde und Bot. i, 324) and 1886 (Gard. Chron. ser. 2, xxv, 53).

A. Skinneri var. *hybrida* Hort. is supposed to be the same as x*A. Jaeschkanii* (*A. chrysantha* var. *Jaeschkanii* Hort.); for a discussion see *A. chrysantha*.

60. **Aquilegia micrantha** Eastwood, in Proc. Calif. Acad. Sci. ser. 2, iv, 559, t. 19 (1895). Fig. 34.

A. ecalcarata subsp. *micrantha* Payson, in Contr. U. S. Nat. Herb. xx, 154 (1918).

A. ecalcarata var. *micrantha* Payson ex Kearney & Peebles, Fl. Plants & Ferns Ariz. 318 (1942).

33. AQUILEGIA SKINNERI, the most southern American columbine.

A. rubicunda Tidestrom, in Amer. Midland Nat. i, 168 (1910); Payson, in Contr. U. S. Nat. Herb. xx, 149 (1918).

A. pallens Payson, in Bot. Gaz. lx, 375 (1915); Contr. U. S. Nat. Herb. xx, 154, t. 13 (1918).

A. lithophila, Payson, in Contr. U. S. Nat. Herb. xx, 146, t. 8 (1918).

A. navajonis A. Nelson, in Amer. Bot. xxviii, 24 (1922).

Stems 3–6 dm. high, 1–3 mm. thick, mostly glandular-pubescent throughout although sometimes glabrous below, freely branched above; basal leaves biternate to triternate, rather thin, green and glabrous or

34. AQUILEGIA MICRANTHA, one of the most variable American species.

pubescent above, green and viscid-pubescent beneath; petioles slender, 4–18 cm. long, more or less glandular-pubescent; primary petiolules 2–6 cm. long, glandular-pubescent and somewhat pilose, the secondary up to about 3 cm. long; leaflets cuneate-obovate to suborbicular, 5–35 mm. long, deeply cleft, the principal divisions with 2–3 rounded-oblong lobes; cauline leaves well developed, the upper bracts lanceolate: pedicels up to about 1 dm. long; flowers erect or nearly so, glandular-pubescent; sepals spreading, white or pale blue to pinkish-lavender or even reddish, oblong-lanceolate, 8–20 mm. long, 3–6 mm. wide, acuminate to blunt; laminæ whitish, erect, oblong-obovate, rounded-truncate, 5–10 mm. long; spurs whitish, rarely reddish or otherwise, slender, straight or spreading, 1.5–2.8 cm. long, about 4 mm. wide near base, narrowed rather rapidly to almost filiform tube with slight apical thickening; stamens 3–5 mm. longer than laminæ, anthers yellow, scarcely 1 mm. long; staminodia 6–8 mm. long, plane, rather abruptly acute: follicles 5, glandular-pubescent, erect or slightly spreading at tips, 10–18 mm. long, the styles 8–10 mm. long; seeds 1 mm. long.

Type locality, canyons of San Juan River, Bluff, Utah. Representative of *A. micrantha* may be cited: Utah, *Tidestrom 1418* (type of *rubicunda*), *M. E. Jones 5298i* and June 7, 1913, *Eastwood* July 12, 1895, *H. C. Cutler 2331*, *Rydberg & Garrett 9488;* Colorado, *Payson 406* (type of *lithophila*), *443* (type of *pallens*), *H. C. Cutler 2628;* Arizona, *M. Darsie* June 16, 1933, *C. T. Vorhies 63.*

As here interpreted *A. micrantha* is a branching viscid-pubescent plant with small erect or partly nodding pale flowers. It is found on damp rocky ledges in the canyons of southeastern Utah, southwestern Colorado and northwestern Arizona, growing in the juniper belt. In Payson's revision were recognized four species: *A. rubicunda*, *A. lithophila*, *A. pallens*, and *A. ecalcarata* var. *micrantha*, the first named being placed near *A. canadensis* with nodding flowers, the last two being separated from each other by biternate and triternate leaves. A careful study of the specimens seen by Payson and the much more abundant material now available convinces me that we have to deal here with one species, varying in color and leaf characters about as do species like *A. chrysantha*, *A. pubescens*, and *A. Shockleyi*, but tending to be triternate, with sepals spreading, spurs slender and straight.

Aquilegia ecalcarata Eastwood, the oldest name, is not available because of *A. ecalcarata* Maxim., so that *A. micrantha* has to be used and the spurless plants become var. *mancosana.*

Payson keyed out *A. rubicunda* in the group with sepals slightly spreading, but on a second sheet of *Tidestrom 1418* at the National Herbarium in an envelope is a more mature flower than on the plant or on the first sheet, and it has horizontally spreading sepals 12 mm. by 5 mm., laminæ about 5 mm., spurs about 2 cm. long. He separated *A. pallens* from *A.*

micrantha on the basis of biternate leaves; as a matter of fact the type collection has some of the leaves almost triternate. *A. lithophila* is more definitely biternate, with nodding flowers, but the latter no more so than in many undoubted specimens of *A. micrantha*.

A. micrantha var. **mancosana** Eastwood, in Proc. Calif. Acad. Sci. ser. 3, i, 77 (1897).

A. mancosana, Cockerell, in Torreya, ii, 75 (1902).

A. ecalcarata Eastwood, in Zoe, ii, 226 (1891), not Maxim. 1889.

A. micrantha var. *ecalcarata* Davis, in Minn. Bot. Studies, ii, 336 (1899).

A. Eastwoodiæ Rydb. in Bull. Torr. Bot. Club, xxix, 146 (1902).

Semiaquilegia Eastwoodiæ Drum. & Hutchins. in Kew. Bull. 165 (1920).

Plants very lax, with slender stems and petioles and leaflets thin, cuneate, 10–15 mm. long: sepals and laminæ much alike, white to pink, 10–15 mm. long; spurs lacking or saccate.

Apparently known only from under cliffs, head of Johnston Canyon, a branch of Mancos Canyon, about twenty-five miles from Mancos, Montezuma County, Colorado. A local variant in a sunless niche-like cavern. Specimen seen: *Eastwood* collected September 1892.

Of the various names I include under *A. micrantha* only *A. rubicunda* is listed in the trade, but I have seen no garden specimens.

61. **Aquilegia cærulea** James, in Long, Exped. Rocky Mts. ii, 15 (1823); Torr. in Ann. Lyceum Nat. Hist. N. Y. ii, 164 (1828); Payson, in Contr. U. S. Nat. Herb. xx, 151 (1918). Fig. 35.

A. canadensis subsp. *cærulea* James ex Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 319 (1893).

Stems 2–8 dm. high, 2–4 mm. thick and mostly quite glabrous below, more or less glandular-pubescent and usually few-branched above: basal leaves biternate, rather thin, green and glabrous above, usually glaucous and glabrous to pubescent beneath; petioles slender, 5–20 cm. long, glabrous to glandular-pubescent, primary petiolules up to 5 cm. long, secondary up to 1 cm. long; leaflets rounded-obovate, 1–3 cm. wide, cleft to near middle, each division with 2–3 round-oblong lobes; cauline leaves few, the uppermost with 1–3 lance-oblong lobes 1–3 cm. long: pedicels up to 15 cm. long; flowers erect; sepals spreading, deep to light blue, elliptic-ovate to lance-ovate, acute to obtuse, 2–4 cm. long, 1–2.3 cm. wide, somewhat glandular-puberulent on backs; laminæ white to whitish, spatulate-obovate, somewhat rounded to truncate or emarginate at apex, 1.5–2.5 cm. long; spurs mostly bluish, straight or curved outward, somewhat pubescent, 3–4.5 cm. long, 3–4 mm. wide near base, gradually narrowed to very narrow tube with gland-tip somewhat enlarged; stamens 4–12 mm. shorter

35. AQUILEGIA CÆRULEA, perhaps the most beautiful columbine.

than laminæ, anthers yellow, 1–2 mm. long; staminodia 8–10 mm. long, lanceolate, acuminate, quite plane: follicles 5–10, 2–3 cm. long, the tips somewhat spreading; styles pubescent, about 1 cm. long; seeds about 1.5 mm. long.

Type locality, on the divide between the Platte and the Arkansas, Colorado. Common in aspen groves and moist places of the pine belt to above timber line (in a reduced form), southwestern Montana to northern New Mexico and eastern Utah. Most abundant in Colorado, where it is widely known as the state flower. Collections representative of *A. cærulea* are as follows: Colorado, *Dr. James* (type), *L. N. Goodding 1696, 1554, F. Tweedy 4246, J. R. Churchill* July 7, 1912, *C. S. Sheldon 103, I. W. Clokey 4121, R. C. Rollins 1902, F. E. & E. S. Clements 264, Biltmore Herb. 6531a, C. F. Baker 494, 847, W. W. Eggleston 5784, Tidestrom 3716, Baker, Earle & Tracy 259, 254, 167:* New Mexico, *Standley 6843, 4178, C. B. Wolf 2974;* Wyoming, *L. Williams 2388, A. Nelson 249;* South Dakota, *T. A. Williams* in 1892; Montana, *E. A. Mearns 2204.*

Aquilegia cærulea is a variable plant; individuals with glabrous or pubescent leaves seem to occur in no definite geographical pattern. Flower color varies widely, with some geographical correlation, but other minor variants have been proposed, such as: f. *pallidiflora* Cockerell (Bull. Torr. Bot. Club, xviii, 168, 1891) from Lakes of the Clouds, Custer County, Colorado, with smallish flowers, white tinged with blue; and f. *glandulosa* Cockerell (l.c.), rather glandular-viscid. Such variations based on leaf size, pubescence, shades of color, flower size, could be multiplied many times.

For the variants with sufficient constancy and definite enough range for nomenclatural recognition, the following key is presented. But even with these varieties, such as *ochroleuca*, considerable difficulty is met in placing dried specimens when no data are available as to color, since bluish flowers may become quite colorless in pressing.

Key to varieties of *A. cærulea:*

A. Leaves triternate or tending so; leaflets mostly less than 2 cm. long: sepals bluish to pink or white, 2.5–4.5 cm. long; spurs 4–7 cm. long. Southern Utah, northern Arizona.....c. var. *pinetorum*

AA. Leaves biternate, the leaflets mostly more than 2 cm. long.

B. Spurs wanting.....d. var. *Daileyæ*

BB. Spurs well developed.

C. Sepals about 2 cm. long; laminæ 1–1.5 cm. long. Northwestern Wyoming.....b. var. *alpina*

CC. Sepals 2–4 cm. long; laminæ 1.5–2.5 cm. long.

D. The sepals blue. Montana to New Mexico.....*A. cærulea*

DD. The sepals pale. Idaho and western Wyoming to Utah...a var. *ochroleuca*

a. **A. cærulea** var. **ochroleuca** Hook. in Bot. Mag. sub t. 5477 (1864). *A. leptocera* Nutt. in Journ. Acad. Philadelphia, vii, 9 (1834).

A. cærulea var. *leptocera* A. Nelson, in Coulter, Man. Bot. Rocky Mts. 191 (1909).

A. macrantha Hook. & Arn. Bot. Beechey Voy. 317, t. 72 (1840) pro syn.

A. cærulea var. *macrantha* Hook. ex Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 319 (1893).

A. cærulea var. *albiflora* Gray, Synopt. Fl. N. Amer i, pt. 1, 44 (1895).

A. cærulea subsp. *albiflora* Gray ex Payson, in Contr. U. S. Nat. Herb. xx, 152 (1918).

Leaves biternate; leaflets mostly 2–4.5 cm. long, glaucous beneath: sepals whitish or pale, 2–4 cm. long; spurs 2.5–4.5 cm. long, very slender toward tips.

Type locality, "Valleys of Rocky Mts., towards southern sources of the Columbia." Range, central Idaho to central Utah, western Wyoming and Colorado. It is rather an indefinite entity. Representative material of var. *ochroleuca* is: Idaho, *E. B. & L. B. Payson 2172, J. F. MacBride & E. B. Payson 3113;* Utah, *S. Watson 37, L. N. Goodding 1219, E. B. & L. B. Payson 5144, W. W. Eggleston 14153, Susan D. McKelvey 4201, M. E. Jones 5684a;* Wyoming, *Merrill & Wilcox 979, M. Ownbey 971, E. B. & L. B. Payson 3262, 4395, 2723.*

Hooker in plate 5477 figures a columbine with bluish sepals and proposes also his "Var. *ochroleuca;* floribus ochroleucis" and under this cites in synonymy "*A. leptoceras*" Nutt. He gives for var. *ochroleuca:* "Tab. Nostr. 5477," which is an error. But his discussion at the bottom of the page makes clear that plate 5477 is to illustrate *cærulea* proper and the earlier plate 4407 is for var. *ochroleuca.* Since this varietal name is so much older than the more generally used *albiflora,* it must be taken up. Nuttall had designated in the herbarium as "A. *ochroleuca" a specimen collected by Wyeth (from Wyeth, Rocky Mountains) which must be part of the type of his *A. leptocera,* hence also of Hooker's var. *ochroleuca.* A badly eaten fragment of this collection is at Philadelphia Academy of Natural Sciences, but is inadequate for me to determine with certainty that it is not Nelson's var. *alpina.* However, the latter seems to be more definitely to the east of where this must have been taken (somewhere in Idaho) and has bluish sepals; moreover, Nuttall says that the Wyeth plant does not have blue on the flowers.

b. **A. cærulea** var. **alpina** A. Nelson, First Rept. Fl. Wyo. 78 (1896).

A. cærulea subsp. *alpina* Payson, in Contr. U. S. Nat. Herb. xx, 152 (1918).

A. oreophila Rydb. in Bull. Torr. Bot. Club, xxix, 146 (1902).

A. Piersoniana Williams, in Ann. Mo. Bot. Gard. xxi, 344 (1934).

Stems 3–6 dm. high: leaflets 2.5–3.5 cm. wide: sepals pale blue, about 2 cm. long; laminæ yellowish, 1–1.5 cm. long; spurs 2.5–3.5 cm. long.

Type locality, Union Peak, Wind River Mountains, Wyoming. Found in the mountains of northwestern Wyoming. Representative material seen: Wyoming, *Maguire 1159, A. & E. Nelson 6412, E. B. & L. B. Payson 2219, E. D. Merrill & E. N. Wilcox 1064, L. Williams 872* and August 10, 1932 (type of *Piersoniana*), *A. Nelson 894* (type); Utah, *M. E. Jones 11871*. The type of *A. Piersoniana* is a dwarf plant with hanging flowers and may possibly be a hybrid with *A. flavescens*.

c. **A. cærulea** var. **pinetorum** Payson ex Kearney & Peebles, Fl. Plants & Ferns Ariz. 318 (1942).

A. pinetorum Tidestrom, in Amer. Midland Nat. i, 166 (1910).

A. cærulea subsp. *pinetorum* Payson, in Contr. U. S. Nat. Herb. xx, 152 (1918).

Leaves tending to be triternate, the leaflets mostly less than 2 cm. long, glaucous or green beneath: sepals bluish to pink or white, 2.5–4.5 cm. long; spurs mostly 4–7 cm. long, very slender.

Type locality, Warm Spring Canyon, Buckskin Mountains, northern Arizona. Growing at elevations mostly of 7000–11,000 feet in mountains of southern Utah and northern Arizona and approached by plants of the Uintah Basin in northeastern Utah. As here understood the var. *pinetorum* is more comprehensive an entity than usual, with small leaflets, tendency toward triternate leaves, flowers bluish to reddish to whitish, often unusually large, spurs very slender. There is much intergradation with *A. cærulea* and with var. *ochroleuca;* at best the variety is not well marked; then too *A. cærulea* intergrades through this variety with *A. chrysantha*. Collections representative of var. *pinetorum* are: Utah, *E. H. Graham 8241, 6304, F. W. Gould 1830, 1977, 1916, A. H. Holmgren 21960, Beck & Tanner 8223, B. Maguire et al. 15903, 15904, 15902, Rydberg & Garrett 8853, Maguire & J. D. Rudd 1785, 1786, 1788, E. P. Walker 312;* Nevada, *Pennell & Schaeffer 23004, A. E. Hitchcock 1321;* Arizona, *E. A. Goldman 2920, Tidestrom 2328* (type), *Goodman & Hitchcock 2864*.

d. **A. cærulea** var. **Daileyæ** Eastwood, in Proc. Calif. Acad. Sci. ser. 3, i, 76, t. 7 (1897).

A. cærulea subsp. *Daileyæ* Payson, in Contr. U. S. Nat. Herb. xx, 152 (1918).

Sepals blue, 3–4 cm. long; petals lanceolate, flat, blue, 2–2.5 cm. long, 5–6 mm. wide, acuminate; spurs lacking.

Type locality, Estes Park (now Rocky Mountain National Park), Colorado. Specimens seen: *J. A. DeFrance* collected June 1926 and July 1926.

Aquilegia cærulea vies with *A. chrysantha* as one of the American columbines having most influence on garden hybrids. According to the Gardeners' Chronicle (ser. 2, xxi, 423, 1897) it appeared in English horticulture in 1864. It is not surprising that flowers of such size and beauty and variability in nature should have been widely used. Many names appear in horticultural literature, for most of which I have not been able to check actual specimens as to botanical affinity: var. *alba* Hort., apparently the same as var. *albiflora* Hort. and Gray; a large white columbine, differing from the var. *alba* of *A. chrysantha* by its more obtuse sepals and shorter stamens. Var. *candidissima* Hort. is listed as large-flowered and snow-white. Snow Queen seems also to be a white form of *A. cærulea*, with triternate leaves as in var. *pinetorum*. Var. *citrina* Hort., height 4.5 dm., flowers citron-yellow (Moellers Deutsche Gaertnerzeitung, xliii, 30, 1928). Var. *cuprea* Hort. (Copper Queen), copper-red, with long spurs and bright yellow laminæ (see Hahn, Gartenwelt, xxxiv, 280, 1930, and Duffy, Amer. Home, iii, 502, 1930). Var. *Daileyæ* Eastwood, the spurless blue type is occasional in cultivation. Var. *delicatissima* Hort., offered by some European firms and described as delicate light yellow passing into satin-rose. The American *A. delicatissima* Hort. is pink and long-spurred and may be a form of the same. Var. *flore-pleno* Hort., flowers double (Jahrb. für Gartenkunde und Bot. ii, 146, 1884). Var. *Helenæ* Hort. (x*A. Helenæ* Hort.), produced by crossing *A. flabellata* with *A. cærulea* (according to Journ. Roy. Hort. Soc. xxvii, 283, 1902, and G. Arends, Gartenwelt, vi, 210, 1902); it should be rather low in growth with dull purplish-blue sepals and white-tipped laminæ and rather long slender spurs; most material named *Helenæ* in the American trade seems to lack the white tips and to have shorter spurs. Professor Anderson writes me that Miss Schafer and he remade *A. Helenæ*, which is a beautiful thing. Material in the trade, even when morphologically correct, lacks the vigor of the first generation hybrid. *A. Helenæ* var. *grandiflora* Hort. is also offered. Var. *hybrida* Hort. is a hybrid between *A. cærulea* and *A. chrysantha*, with pale violet sepals and primrose-yellow laminæ (Floral Mag. 1877, t. 271, Gard. Chron. ser. 2, viii, 198, 1877). Now under the general heading of *A. cærulea* var. *hybrida* is included a host of our commonest and most effective garden columbines. Undoubtedly they include much more than the original *cærulea* and *chrysantha* "blood" such as that of *A. formosa*, but can conveniently be considered together. *A. haylodgensis* Hort. (*A. cærulea hybrida*), sepals from violet to blue through rose, white to yellow, laminæ yellow, spurs delicate (Moellers Deutsche Gaertnerzeitung, xx, 392, 1905). *A. haylodgensis* var. *delicatissima* Hort. seems

mostly to be a blue strain. Var. *rosea* Hort. (*A. rosea* Hort.) is largely a strain of long-spurred pinks or reds, in part with double flowers; rather frequent in the trade. Var. *sanguinea* Hort., sepals dark blood-red, corolla soft old-gold (Gartenwelt, xxxiv, 280, 1930).

Names have been used ad infinitum for various breeder's products: Blush Beauty, Rose Queen, Lavender Queen, Newsell's Pink, Newsell's Red, *A. cærulea* Mrs. M. Nicholls, Newsell's Giant Blue, Mrs. Scott Elliott's strain, Diadem, Dobbie's Imperial hybrids, Rainbow mixture, Farquahar's Long-spurred hybrids. Some of these vary widely through many shades; some throw many rogues. Others like Crimson Star, Fig. 1, (sepals and spurs crimson, petals creamy-white, see Journ. Roy. Hort. Soc. lvi, page xxxi, 1931) seem to produce a good even stock. Many of them are very beautiful and for the most part, even though they may not come true from seed, they do continue to produce new generations of desirable plants.

An interesting spurless mutant from the Scott Elliott strain appeared in delicate rose and mauve shades, with perianth-segments 3.5–4.5 cm. long. It was cited as *A. clematiflora* (Rev. Hort. cix, 414, 1937) as a novelty for 1936 and 1937 and now appears under that name in the trade.

62. **Aquilegia scopulorum** Tidestrom, in Amer. Midland Nat. i, 167, t. 11 (1910). Fig. 7.

A. scopulorum subsp. *perplexans* Clokey, in Bull. S. Calif. Acad. Sci. xxxvii, 3 (1938).

Stems from much-branched cespitose caudex, 5–20 (30) cm. high, 1–2 mm. thick, glaucous, glabrous below and viscid-pubescent above or the latter throughout, 1–2-few-flowered: basal leaves forming a dense tuft, biternate, glaucous; petioles glabrous, glaucous, 2–7 cm. long, petiolules up to 1 cm. long; leaflets crowded, subsessile, rounded, coriaceous, glabrous, 5–15 mm. wide, 2–3-cleft, then each segment with 2–3 round-oblong lobes; cauline leaves usually 2 or more, gradually reduced up the stem: flowers erect; sepals spreading, blue to white, sometimes red, ovate-oblong, 15–20 mm. long, 6–9 mm. wide, obtuse to acutish; laminæ white to yellowish, blue or red, oblong, rounded at apex, 10–12 mm. long; spurs straight, 2.5–3.5 cm. long, about 3 mm. wide at base, gradually narrowed almost at once into very slender outer portion with but slightly enlarged gland; stamens scarcely exceeding laminæ or up to about 2 mm., anthers yellow, about 1 mm. long; staminodia about 7 mm. long, subacuminate, sometimes with rudimentary anthers, slightly crinkled: follicles glandular-pubescent, 15–18 mm. long, with somewhat spreading tips, the pubescent styles about 8 mm. longer; seeds almost 2 mm. long.

Type locality, Wasatch Peak, central Utah. Apparently mostly on limestone at elevations of 7000–11,000 feet, central Nevada and southern Utah. Representative specimens are: Nevada, Lander County, *A. E. Hitchcock 884*, *P. B. Kennedy 4181*, White Pine County, *Hitchcock 1317*,

Pennell & Schaeffer 23185, R. C. Rollins & T. S. Chambers 2476, S. D. Warner June 28, 1940, Clark County, *Clokey 7094* (type of *perplexans*), *5464*: Utah, San Pete County, *Tidestrom 1788* (type), *J. A. Harris C23920*, Kane County, *F. W. Seaman 107, 114, Mrs. A. P. Thompson*, Garfield County, *Pennell & Schaeffer 21883, Eastwood & Howell 774, R. S. Ferris & L. Lorraine 9349.*

The subspecies *perplexans* of Charleston Peak, southern Nevada, seems to have no differentiating character except some red in the flowers of some of the plants. Utah plants range from blue, blue-purple to white for sepals and bluish to yellowish petals. Since the Charleston Mountain plants have these colors, or add, in some cases, red to give red, blue, blue and white, red and white, red and yellow, white, yellow, they seem too indefinite to stand as a separate subspecies.

† **A. scopulorum** var. **calcarea** stat. nov.

A. cærulea var. *calcarea* M. E. Jones, in Proc. Calif. Acad. Sci. ser. 2, v, 619 (1895).

A. scopulorum f. *calcarea* Tidestrom, in Amer. Midland Nat. i, 170 (1910).

Petioles glandular-pubescent.

Type from above Tropic, Garfield County, Utah. This is not a very distinct entity, and is illustrated by the following collections: Wyoming, *Cary 635* in part; Utah, Sevier County, *Rydberg & E. C. Carlton 7334, Mrs. F. M. Stone 230*, Garfield County, *M. E. Jones 5312a* (type), *W. P. Cottam C2764, Susan D. McKelvey 4304, 4328, K. E. Wright* in 1931.

Aquilegia scopulorum is occasionally offered by dealers in native plants. It should be a desirable subject for rock-gardens in cold climates, being subalpine in its native habitat.

63. **Aquilegia pubescens** Coville, in Contr. U. S. Nat. Herb. iv, 56, t. 1 (1893). Fig. 36.

A. cærulea var. *chrysantha* f. *pubescens* Rapaics, in Bot. Közlem. viii, 136 (1909).

Stems tufted, 2–4.5 dm. high, 2–4 mm. thick and glabrous below, glandular-pubescent above or even throughout, with few short erect branches above: basal leaves ternate to biternate, thickish, pale green above, sometimes glaucous beneath, glabrous to pubescent on both surfaces; petioles 5–20 cm. long, slender, glabrous to pubescent, petiolules up to 4 (6) cm. long; leaflets crowded, rounded-obovate, deeply cleft, 1–2 (3) cm. wide, the divisions few-toothed or lobed; cauline leaves few, the uppermost 1–3-lobed, 5–30 mm. long: pedicels short; flowers erect, glandular-puberulent; sepals spreading, cream to yellow or pink, lance-oblong to ovate, acutish, 1.5–2 cm. long, 5–9 mm. wide; laminæ oblong, rounded to

36. AQUILEGIA CHRYSANTHA, an important species in horticulture. AQUILEGIA PUBESCENS at extreme lower left.

retuse at apex, 8–12 mm. long; spurs straight to spreading, 2.5–4 cm. long, 4–5 mm. wide at base, gradually narrowed to very slender tube with swollen tip; stamens exceeding laminæ by 3–6 mm., anthers yellow, 1–1.5 mm. long; staminodia 7–8 mm. long, crinkled on margins, acuminate: follicles pubescent, 2–2.5 cm. long, with spreading tips, the pubescent styles 10–12 mm. long; seeds about 1.5 mm. long.

Type locality, trail to White Chief mine, near Mineral King, Tulare County, California. A species of rocky places and talus slopes, at elevations of 9000–12,000 feet, in the Sierra Nevada of California from Tuolumne County to Inyo County. Representative collections of *A. pubescens* are: *H. M. Hall 11820, 5654, Eastwood 607, J. Coulter 2, H. N. Bolander 6263, R. A. Ware 2736C, Hall & Chandler 671, A. L. Grant 1664, 1073, H. M. Hall & H. D. Babcock 5230, J. W. A. Wright* July 1881, *F. V. Coville & F. Funston 1513* (type), *J. D. Culbertson under Baker 4378, R. S. Ferris 8916.*

Aquilegia pubescens varies considerably in amount of pubescence (*Eastwood 607, Brewer 1811, Coulter 2, Hall 11820* being more pubescent in lower parts), in flower color (many collectors believing they see influence of *A. formosa* var. *pauciflora* in the reddish cast), and in width of sepals. It is geographically widely separated from related species and amply distinct from them, and seems to maintain a fairly definite character of its own, even though it grows near *A. formosa* var. *pauciflora.*

The species is sometimes offered by American dealers in native plants.

64. **Aquilegia chrysantha** Gray, in Proc. Amer. Acad. Arts & Sci. viii, 621 (1873); Payson, in Contr. U. S. Nat. Herb. xx, 156 (1918). Fig. 36.

A. leptocera var. *chrysantha* Hook. f. in Bot. Mag. t. 6073 (1873).

A. leptocera var. *flava* Gray, Pl. Wright. ii, 9 (1853).

A. formosa subsp. *cærulea* var. *chrysantha* Gray ex Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 320 (1893).

A. cærulea var. *chrysantha* Rapaics, in Bot. Közlem. viii, 136 (1909).

Stems 4–12 dm. high, 2–5 mm. thick at base, glabrous at base and glandular-pubescent above or throughout, usually much-branched above: basal leaves mostly triternate, rather thin, glabrous and light green above, glaucous and glabrous to pubescent beneath; petioles slender, 5–20 cm. long, glaucous, glabrous or pubescent; primary petiolules 2–5 cm. long, secondary about half as long, tertiary 0–2.5 cm. long; leaflets cuneate-obovate to orbicular-obovate, 1–2.5 (4.5) cm. long, cleft to middle or beyond, the main divisions with 2–3 round-oblong lobes; cauline leaves well developed: pedicels up to about 1 dm. long; flowers erect, clear golden-yellow throughout, somewhat glandular-pubescent; sepals spreading, lanceolate to ovate-lanceolate, usually acuminate, 2–3.5 cm. long, 0.5–1 cm. wide; laminæ oblong-obovate, usually rounded at apex, spreading,

8–16 mm. long; spurs usually spreading, 4–7 cm. long, 4–6 mm. wide at base, gradually narrowed to almost filiform tube with slight apical thickenning; stamens usually exceeding laminæ by 8–10 mm., anthers 1.5–2 mm. long; staminodia 9–12 mm. long, very little crinkled, subacuminate: follicles glandular-pubescent, 2–3 cm. long, the tips spreading; styles pubescent, 12–18 mm. long; seeds about 2 mm. long.

Type locality, Organ Mountains, southern New Mexico. Growing in moist places at elevations of 3500–11,000 feet, from Grand Canyon in Arizona and northern New Mexico to Sonora and Chihuahua. Representative material is: New Mexico, *E. A. Goldman 1707*, *E. O. Wooton* August 29, 1894 and May 26, 1905; Arizona, *J. T. Rothrock 196*, *Eastwood 17502*, *Kearney & Peebles 12334*, *Susan D. McKelvey 2152*, *Rose E. Collom 22*, *C. B. Wolf 3141*, *D. T. MacDougal 235*, *J. C. Blumer 3256*, *3592*, *1600*, *Pringle* May 17, 1884, *J. G. Lemmon 2627*, *L. N. Goodding 175*, *W. Stone 210;* Chihuahua, *C. V. Hartman 725.*

On the whole *A. chrysantha* seems an amply distinct species, but dried specimens without color notes are often difficult to separate from *A. cærulea* var. *pinetorum* which has whitish flowers with long slender spurs and a tendency to triternate leaves. This latter plant seems to be mostly north of Grand Canyon; it tends to have blunter sepal tips and laminæ more erect and scarcely if at all surpassed by stamens.

Rydberg's *A. thalictrifolia* was proposed largely for the yellow-flowered columbines of southern Colorado on the basis of smaller flowers. At best the characters he used are poor and it is easy to match his specimens with occasional plants from throughout the range of *A. chrysantha*, such as subalpine plants from San Francisco Mountains, Arizona and *F. W. Johnson* April 28, 1910 from Ray, Pinal County, Arizona. I am, therefore, proposing varietal rank for this Colorado series:

† **A. chrysantha** var. **Rydbergii** nom. nov.

A. thalictrifolia Rydb. in Bull. Torr. Bot. Club, xxix, 145 (1902), not Schott & Kotschy 1853.

Flowers smaller, sepals mostly 10–18 mm. long; laminæ 7–12 mm. long; spurs 3.5–4 cm. long; stamens exserted 3–4 mm.; mature styles about 1 cm. long.

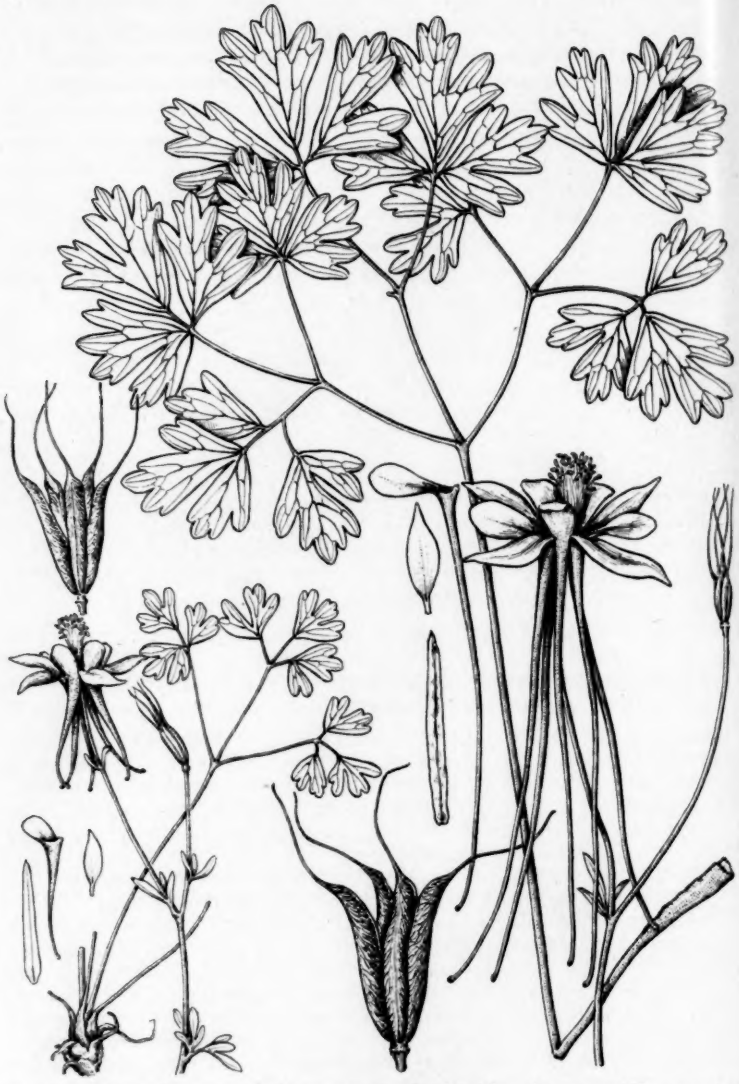
Type locality, Canyon City, Colorado. Range, southern Colorado. Specimens seen: *B. H. Smith* July 4, 1885, *De Alton Saunders* July 1893, *H. C. Benke 4190*, *Mrs. S. B. Walker*, *C. S. Sheldon 334*, *5850*, *E. Hall*, *M. E. Jones 936*, *P. Blatchford* July 12, 1883, *T. S. Brandegee* June 3, 1873 and June 1877, *E. L. Greene* June 23, 1873 (type of *thalictrifolia*).

The var. *Rydbergii* suggests *A. Chaplinei* of a more southern range in flower size, but has shorter stamens and styles.

Aquilegia chrysantha is one of the more important garden species, both for itself and for its contribution to hybrids. It is said (Gard. Chron. ser. 3, xxi, 423, 1897) to have been introduced into cultivation in England in 1873. It was at once used in hybridization as evidenced by such names as *A. cærulea* var. *hybrida* Hort. (Gard. Chron. ser. 2, viii, 198, 1877), a hybrid of *cærulea* and *chrysantha*, and *A. californica* var. *hybrida* Hort. (Gard. Chron. ser. 2, viii, 503, 1877), a hybrid of *californica* (*formosa*) and *chrysantha*. Many horticultural names have been proposed under *A. chrysantha* and several are still used: Var. *alba* Hort., flowers white, sepals about 2 cm. long. The variety Silver Queen is apparently the same. Var. *alba-plena* Hort., flowers whitish, with 2 or more whorls of laminæ; said to have been introduced in 1889 (Vicks Mag. xii, 311, 1890). Var. *grandiflora alba* Hort., flowers pure white and large; said to come true from seed (Zeitschr. für bildende Gartenkunst, i, 32, 1890), but some stocks are reported to be very mixed (Journ. Roy. Hort. Soc. liii, 161, 1928). Var. *grandiflora sulphurea* Hort., sepals large, deep cream; petals creamy-yellow (see Journ. Roy. Hort. Soc. liii, 161, 1928). Var. *Jaeschkanii* Hort. (*A. Jaeschkanii* Hort.), supposedly a hybrid of *A. Skinneri* and *A. chrysantha*, with carmen-red sepals and spurs and bright yellow petals; said to come true from seed (Jahrb. für. Gartenkunde und Bot. i, 324, 1884). Var. *nana* Hort. Nicholson (Dict. Gardening, Suppl. 78, 1900) described this as about 6.5 dm. high, flowers golden-yellow; introduced 1890. Var. *flore-pleno* Hort., R. Ulle (Gärtnerzeitung, xliii, 30, 1928) wrote that this grew to be 90 cm. high and came true from seed in about seventy percent of the plants.

65. **Aquilegia Chaplinei** Standley ex Payson, in Contr. U. S. Nat. Herb. xx, 156 (1918). Fig. 37.

Stems 2–5 dm. high, 1.5–3 mm. thick at base, glabrous except for the glandular-pubescent upper parts, openly branched: basal leaves biternate to triternate, glabrous and somewhat glaucous above, glabrous to somewhat pubescent and more glaucous beneath; petioles very slender, glabrous, 5–12 cm. long; primary petiolules glabrous, 1–4.5 cm. long, secondary up to 2 cm. long; leaflets cuneate-obovate to suborbicular, thickish in texture, 1–1.5 cm. long, cleft to or below the middle, each segment then with 2–3 rounded-oblong teeth or lobes; cauline leaves several, gradually reduced upward: pedicels up to about 1 dm. long; flowers suberect, pale yellow, somewhat pubescent; sepals spreading, broadly lanceolate, acute or obtuse, 13–16 mm. long, 4–6 mm. wide; laminæ oblong, truncate-rounded, 8–10 mm. long; spurs yellow, slender, straight or spreading, 3–4 cm. long, about 4 mm. wide at base, then gradually narrowed to almost filiform tube and slightly enlarged at tips; stamens exceeding laminæ by almost 1 cm., anthers pale, about 1 mm. long; staminodia 7 mm. long, plane, rather abruptly narrowed at tip: follicles 18–22 mm. long, glandular-pubescent, with slightly flaring tips; styles pubescent, about 1.5 cm. long; seeds almost 2 mm. long.



37. AQUILEGIA LONGISSIMA, the longest-spurred columbine. AQUILEGIA CHAPLINEI at lower left.

Type locality, Sitting Bull Falls, Eddy County, New Mexico. Known from moist places in the Guadalupe Mountains of Eddy County, New Mexico, and Culberson County, Texas. Specimens seen: Texas, *V. L. Cory 9422, Standley 40505, J. A. Moore & J. A. Steyermark 3549;* New Mexico, *Standley 40754, H. Wilkens 2255, W. R. Chapline 544* (type).

This species differs from *A. chrysantha* by its smaller flowers and leaves and lower stature. It does not seem to be in the trade.

† 66. **Aquilegia Hinckleyana** spec. nov. Fig. 38.

Stems 5–7 dm. high, 4–7 mm. thick at base, glabrous and glaucous below, glandular-pubescent and freely branched in the inflorescence: basal leaves biternate, glabrous and pale green above, glabrous and more glaucous beneath; petioles glabrous, rather slender, 2.5–3 dm. long, primary petiolules subglabrous, 2.5–5 cm. long, glaucous, secondary up to 2.5 cm. long, sparingly pilose; leaflets suborbicular, rather thin in texture, 2–4 cm. long, cleft to about the middle, each segment then with 2–3 rounded-oblong teeth or lobes; cauline leaves several, gradually reduced upward: pedicels up to about 7 cm. long; flowers suberect, golden-yellow, subglabrous; sepals spreading, ovate, obtuse, about 25 mm. long, 17 mm. wide; laminæ spatulate-obovate, rounded-truncate, 20 mm. long, 16 mm. wide; spurs slender, straight or slightly curved, about 4 cm. long and 5 mm. wide at base, then gradually narrowed to almost filiform tube and slightly enlarged tip; stamens exserted 6–7 mm.; staminodia 12–14 mm. long, abruptly narrowed at apex: follicles 20–25 mm. long, glandular-puberulent, with slightly flaring tips; styles almost glabrous, filiform, about 2 cm. long; seeds about 1.5 mm. long.

Caules 5–7 dm. alti, base 4–7 mm. crassi, glabri glaucique, supra glanduloso-pubescentes et ramosi: foliis basalibus biternatis, supra glabris et glaucis, infra glabris et glaucioribus; petiolis glabris, tenuibus, 2.5–3 dm. longis; petiolulis primariis subglabris, 2.5–5 cm. longis, glaucis, secondariis ad 2.5 cm. longis, sparsim pilosis; foliolis suborbicularibus, submembranaceis, 2–4 cm. longis, ad medium fissis, cum divisionibus 2–3-rotundato-oblongo-lobatis; foliis caulium paucis: pedicellis ad 7 cm. longis; floribus suberectis, aureis, subglabris; sepalis patentibus, ovatis, obtusis, 25 mm. longis, 17 mm. latis; laminis spathulato-obovatis, rotundato-truncatis, 20 mm. longis, 16 mm. latis; calcaribus tenuibus, subrectis, 4 cm. longis, base 5 mm. latis, cum tubo subfiliforme et apice paulum incrassato; staminibus laminis 6–7 mm. longioribus; parastemonibus 12–14 mm. longis, apice abrupte angustatis: folliculis 20–25 mm. longis, glanduloso-puberulentis, cum apicibus paulum divergentibus; stylis subglabris, filiformibus, circa 2 cm. longis; seminibus 1.5 mm. longis.

Type from moist bank under Capote Fall, Brite Ranch, about thirty-five miles west of Marfa, Presidio County, Texas, March 28, 1943, *L. C. Hinckley 2672* (Gray Herbarium, paratype at Bailey Hortorium). Mr. Hinckley reports this as forming a thick bed on the always moist bank under the overhanging cliff at the fall and that he did not find it at any other spot in the Sierra Tierra Vieja. Although but a single collection has come

to hand, I cannot make other disposition than to name this as new and it is a pleasure to dedicate it to its discoverer, Mr. L. C. Hinckley of Marfa, Texas.

The proposed species differs from *A. longissima* (which it resembles in petiole length, large spatulate-obovate petals, and long styles) in having biternate leaves, sepals twice as wide, spurs one-half to one-fourth as long, and blunter staminodia. It differs from *A. chrysantha* (with which it agrees in sepal length, spur length and perhaps style length) in having leaves

38. AQUILEGIA HINCKLEYANA, with staminodium x 2½, and petal and sepal x ½, at lower left.

biternate, sepals wider, petals longer and wider, staminodia more blunt. It differs from *A. Chaplinei* (with which it may agree in biternate leaves, length of spurs, blunt staminodia, and style length) in the longer petioles, longer and wider sepals and laminæ, longer staminodia.

For the specimens I have seen of this complex of four species, *A. chrysantha* ranges in New Mexico, Arizona and adjacent Mexico, *A. longissima* in Fort Davis and Brewster counties, Texas, with stations in Coahuila and Arizona, *A. Chaplinei* in Culberson County, Texas and adjacent New Mexico, *A. Hinckleyana* in Presidio County, Texas.

67. **Aquilegia longissima** Gray apud Watson, in Proc. Amer. Acad. Arts & Sci. xvii, 317 (1882); Payson, in Contr. U. S. Nat. Herb. xx, 157, t. 14 (1918). Fig. 37.

A. cærulea var. *chrysantha* f. *longissima* Rapaics, in Bot. Közlem. viii, 136 (1909).

Stems 5–9 dm. high, 2.5–6 mm. thick, glabrous below and glandular-pubescent above, or glandular-pubescent throughout, open-branched above: basal leaves triternate, rather thin, light green and glabrous to slightly pubescent above, glaucous and glabrous to pubescent beneath; petioles slender, 2–3 dm. long, glabrous to pubescent; primary petiolules 3–5 cm. long, secondary 1–5 cm., tertiary 0.2–1.5 cm. long; leaflets much as in *A. chrysantha*, 1.5–4.5 cm. long; cauline leaves well developed: pedicels up to 2 dm. long; flowers erect, pale yellow, somewhat glandular-puberulent; sepals spreading, lanceolate, acuminate, 2.5–3 cm. long, 6–8 mm. wide; laminæ spreading almost horizontally, spatulate to spatulate-obovate, 15–25 mm. long, rounded to emarginate; spurs filiform, pendent, mostly 9–15 cm. long, 2–3 mm. wide at base, the tips about 1.5 mm. thick; stamens 5–12 mm. longer than laminæ, anthers 1.5 mm. long; staminodia 12–14 mm. long, rather plane, subacuminate: follicles glandular-pubescent, 2.5 cm. long, with spreading tips; styles 16–26 mm. long; seeds almost 2 mm. long.

Type locality, Caracol Mountains, south of Monclova, Coahuila. Along streams and in wet places, at 3000–7000 feet, mountains of western Texas to Coahuila and Nuevo Leon, Mexico. Representative collections are: Texas, *J. A. Moore & J. A. Steyermark 3104, 3405, O. E. Sperry T897, 189, B. H. Warnock 811* and August 8, 1937, *E. J. Palmer 34377, 31918, 30742, L. C. Hinckley 48* and July 22, 1936, *V. L. Cory 26502, V. Havard 130, E. G. Marsh 109;* Arizona, *M. F. Gilman 93, E. F. Breninges* June 4, 1897; Coahuila, *E. Palmer 10* (type), *E. G. Marsh Jr. 606, Mrs. J. A. Loomis* June 1938, *F. L. Wynd & C. H. Mueller 626;* Nuevo Leon, *Pringle 10176.*

Aquilegia longissima is apparently adequately distinct from *A. chrysantha* in its longer petioles, longer more horizontal laminæ, longer more delicate spurs, longer staminodia, longer styles, more southern and eastern range.

The exceedingly long slender pendulous spurs make this a most attractive species and one in high favor with gardeners. However, much of the horticultural material bearing this name is actually to be referred to *A. chrysantha*. Some is evidently hybrid, with the red sepal color of *A. formosa* and with relatively short spurs.

UNCERTAIN AND EXCLUDED NAMES

advena Regel, in Ind. Sem. Hort. Petrop. 32 (1856). Description very brief, country of origin not given. It may be *A. leptoceras* Fisch & Mey. Name sparingly in cultivation, but I have not been able to get description of cultivated plants.

alpina var. *himalaica* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 294 (1893).

alpina var. *subbrachyceras* Borbás, in Magyar Tudom. Akad. xii, no. 6, 10 (1882), nomen.

anemonoides Willd. in Mag. d. Ges. d. Naturf. Freunde Berlin, v, 401 (1811) = *Paraquilegia anemonoides* Ulbrich, in Notizbl. Bot. Gart. Berlin, ix, 209 (1925).

barcinonensis Sennen, Le Monde des Pls. xxix, no. 173, 6 (1928), nomen.

Braunii Borbás, in Magyar Tudom. Akad. xii, no. 6, 10 (1882), nomen.

brevistyla var. *patula* Rapaics, in Bot. Közlem. viii, 132 (1909). Described as having the stem low, leafless. It may be *A. Jonesii* Parry.

campylocentra Borbás, l. c., nomen.

canadensis subsp. *americana* Rapaics, op. cit. 136. An indefinite entity divided partly into what I call *A. flavescens* and *A. formosa*.

canadensis subsp. *americana* var. *incarnata* f. *Gärtneri* Rapaics, l. c. = *A. Gaertneri*, Borbás.

concolor Fisch. ex Steud. Nom. Ed. 2, i, 115 (1840), nomen.

corniculata Vill. Cat. Hort. Strasb. 250 (1807), nomen subnudum. Spurs straight, flower small, greenish.

dioica Borbás, l. c., nomen.

elata Ledeb. in Ind. Hort. Dorpat. Suppl. 41 (1824); given as grown from seeds from Davuria, Siberia. Placed as possible synonym of *A. hybrida* in Ledeb. Fl. Ross. i, 57 (1842). In a key to Asiatic species it runs to *A. viridiflora*, but the description does not fit.

Fauriei Lévl. in Bull. Acad. Géogr. Bot. xi, 300 (1902). Based on Faurie 17 and 18 from east Asia; described as having pinnate leaves, spicate inflorescence, oblong-acuminate petals. Cannot be an Aquilegia; I have seen no material nor found any reference to transfer to another genus.

formosa var. *kamschatica* Brühl, op. cit. 320; Boothman, in Gard. Chron. ser. 3, xcv, 281 (1934). The spurs are given as two to four times the laminæ which are truncate at tip.

formosa var. *saxicola* Brühl, l. c.

Gaertneri Borbás, l. c., nomen.

glauca var. *saccocentra* Boothman, op. cit. 351.

Haenkeana var. *orthoceras* Borbás, op. cit. 10, nomen.

Haynaldi Borbás, op. cit. 9, nomen.

Henryi Fin. & Gagn. in Bull. Soc. Bot. France, li, 411 (1904) (*Isopyrum Henryi* Oliver, Hooker Icon. Pl. xviii, t. 1745, 1888; *Semiaquilegia Henryi* Drumm. & Hutchins. in Kew. Bull. 1920, 166) = *Urophysa Henryi* Ulbrich, in Notizbl. Bot. Gart. Berlin, x, 870 (1929).

Kozakii Masamune, in Journ. Soc. Trop. Agr. Taiwan, iv, 301 (1932). A double-flowered plant described from Taiheizan, Taiwan. Description inadequate to place definitely.

lutescens Borbás, in Magyar Tudom. Akad. xii, no. 6, 10 (1882), nomen.

macrocentra Borbás, l. c., nomen.

minuta Steph. ex Ledeb. Fl. Ross. i, 53 (1842) = Paraquilegia sp.?

orthantha Borbás, l. c., nomen.

purprans Hort. ex Bull. Jard. Bot. Brux. xiii, fasc. suppl. 2, 2 (1935), nomen.

pycnotricha Borbás, l. c., nomen.

Rauwolfii Hort. ex Kew. Bull. App. i, 4 (1890), nomen.

Schottii Borbás, l. c., nomen.

sibirica var. *stenopetala* Regel, in Ind. Sem. Hort. Petrop. 33 (1856). Described as having pale blue flowers, lanceolate sepals, spurs twice the laminæ. No place of origin given.

sinensis Heynh. Nomen. Bot. Hort. ii, 41 (1846), nomen.

stenopetala Borbás, op. cit. 8, nomen.

Szaboi Borbás, op. cit. 10, nomen.

tegedensis Parr ex Boothman, in Gard. Chron. ser. 3, xcv, 408 (1934). A native of Spain, said to be related to *A. Einseleana* and with brief description. There may be an earlier reference which I have not been able to find.

thalictroides E. H. L. Krause in Sturm, Fl. Deutschl. Ed. 2, v, 224 (1901) = *Isopyrum thalictroides* Linn. Sp. Pl. 557 (1753).

volubilis Maack ex Trautv. in Act. Hort. Petrop. viii, 54 (1883). A Manchurian plant; nomen nudum in Trautv. and an earlier Russian reference given which I have not seen.

vulgaris var. *grandiflora* Schur, in Verh. Nat. Ver. Brünn, xv, no. 2, 61 (1876). I have been unable to obtain any description.

vulgaris var. *recticornu* Brühl, in Journ. Asiatic Soc. Bengal, lxi, pt. 2, 289 (1893). I cannot place.

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